

# AI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT**

**SEPTEMBER 15, 1955**

## ***In This Issue***

**Automaticity at World's Largest Plating Facility  
Turbo Gas Generator for Tip Jet Helicopters  
Machining Aluminum Honeycomb without Using Fillers  
Silicone-Filled Self-Adjusting Valve Tappet  
Soviet System for Aircraft Design and Production  
Spark Plug Testing with Electronic Misfire Counter**

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**A CHILTON PUBLICATION**

# The New Frontier in Production Economy



by A. Francis Townsend  
Vice President - Engineering  
The Heald Machine Company

Let's call it "automation"—this new frontier we're talking about. Briefly, it means doing things automatically that used to be done by hand or by manual supervision. Productionwise, it opens a vast new field for making substantial cost savings and at the same time improving the quality of the product.

In the machine tool field, we might say that there are two different types of automation—both mighty important.

First, there's the "big automation." That covers the completely automated set-ups involving a number of machine stations, with fully automatic handling of the work as it goes down the line. For large parts, we have the so-called "transfer machine," where the work advances from one station to the next "in series." For smaller work that can be conveyor or hopper fed, an automated production line may consist of a multiplicity of stations, each made up of as many identical machines as are needed to equalize production flow throughout the line. We had a two-unit set-up like this on display at the Machine Tool Show, where automotive pistons were bored and elliptical box turned in a continuous flow with automatic conveying, orienting, loading, horizing, unloading, flushing, gaging and sorting.

SECOND, there's the "little automation." This covers newly automated features of an individual machine. A classic example of this is *feedback*—where the finished work is gaged and intelligence from the gaging unit is fed back to the machine, automatically compensating for tool or wheel wear. Feedback on internal grinders is another new development demonstrated at the Show. Here, after-gaging results are fed back to the diamond unit, automatically changing its position to correct for any tendencies to deviate from the required tolerance. Feedback means less operator effort and attention—assures maximum sustained efficiency of the overall automated production setup. You'll hear much more of this as time goes on.

Automatic loading, gaging, sizing and sorting are other examples of the same thing—letting the machine do a job that used to be done by hand. In addition to the all-important factors of time and cost, these automated operations eliminate the element of human error. A properly functioning machine never gets tired, angry or careless.

Automation is purely a matter of economics. How far you should go—a balance between initial investment and improvement in production cost. But whatever the job, we are confident that proper application of these new Heald developments will enable you to obtain higher efficiency and lower cost per part than ever before. Our field sales engineers will be glad to discuss this with you at any time—in terms of your own production requirements.

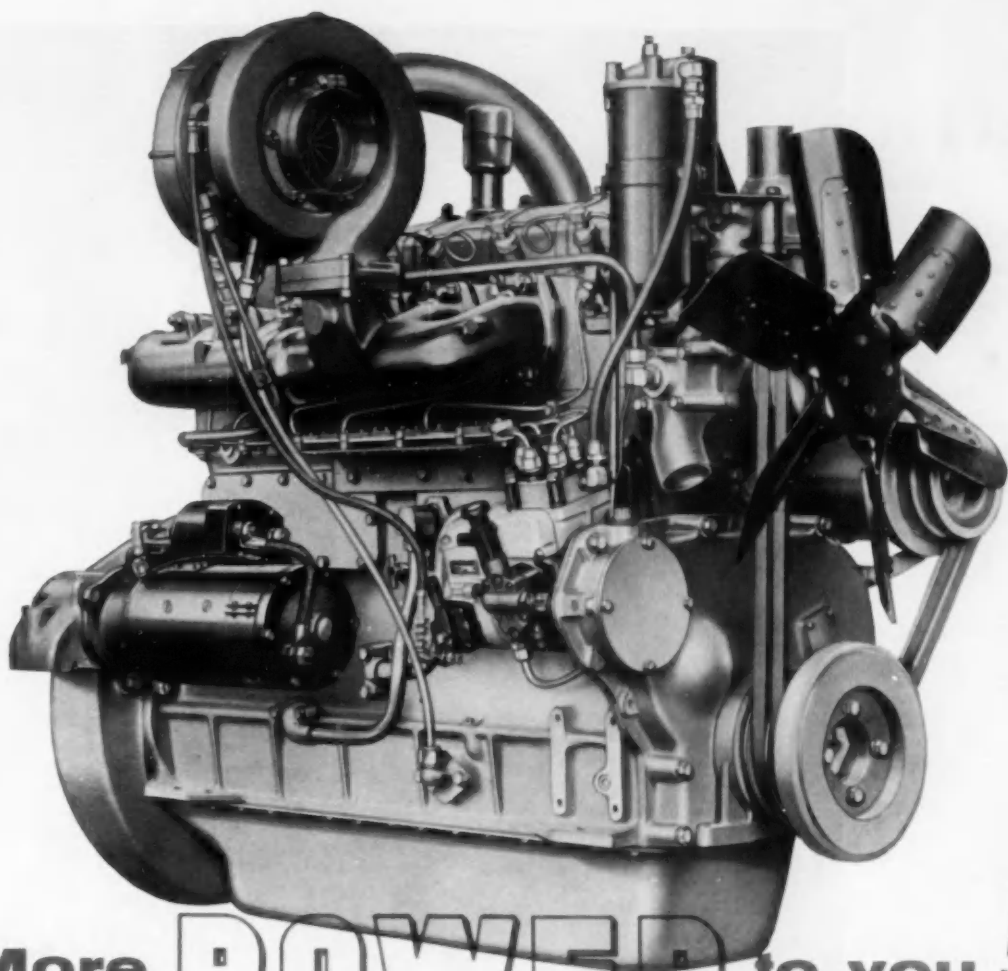
Now, more than ever before, it **PAYS** to come to Heald

**THE HEALD MACHINE COMPANY**  
Worcester 6, Massachusetts

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York







More **POWER** to you!

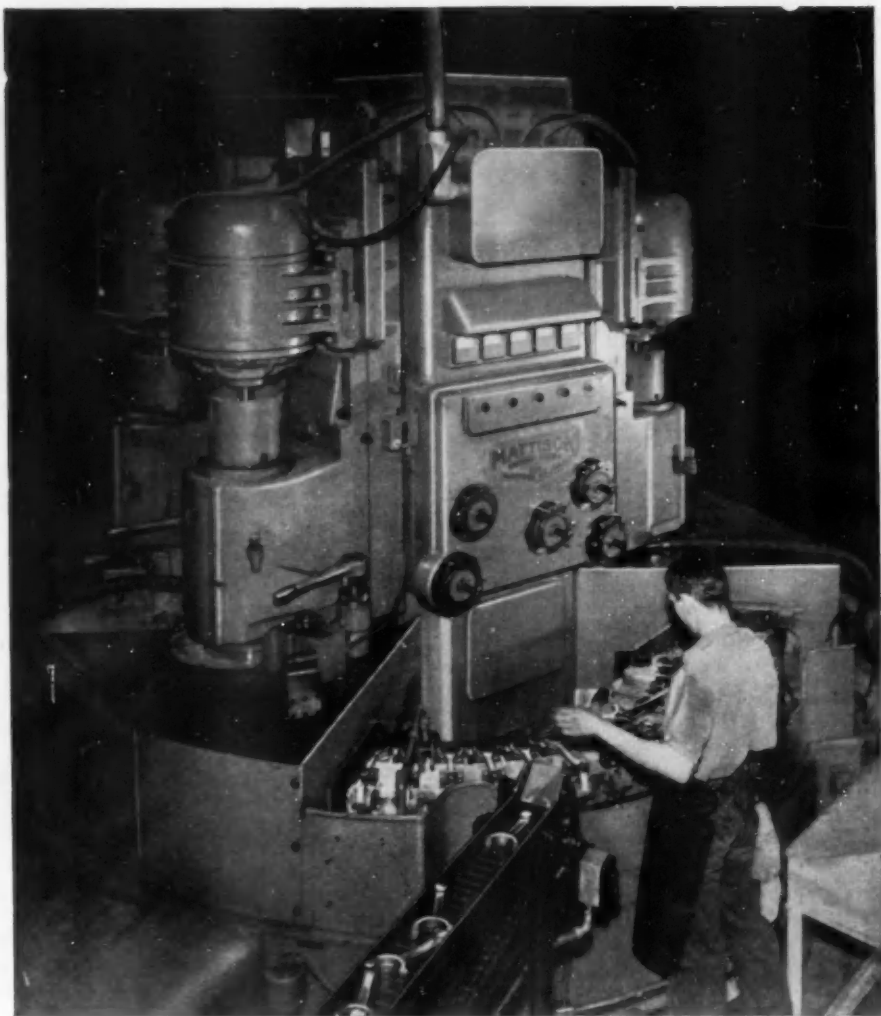
# WAUKESHA

## *Diesels*

Specifically designed for truck service—the Waukesha 135-DK Series high speed Diesels in the 130 hp to 190 hp range are setting high performance and economy records in re-powering 30,000 to 80,000 lb. g.v.w. units. Both are 426 cu. in., six-cyl., 4¼-in. x 5-in. The 135-DKB Normal Diesel develops 147 hp at 2800 rpm. In the 135-DKBS Diesel (shown) output is boosted to 185 hp at the same rpm by turbo-supercharging.

**WAUKESHA MOTOR COMPANY**  
Waukesha Wisconsin  
New York • Tulsa • Los Angeles





● At the Cleveland Engine Plant of the Ford Motor Company, both sides of wrist-pin and crank-pin bosses are accurately ground on a high production basis with this five wheel Mattison (Hanchett-Type) Vertical-Spindle Automatic Rotary Surface Grinder. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation checking the work and keeping all pieces within specified tolerances without operator's attention.

This is only one of the many grinders made by Mattison. Whatever your surface grinding problems may be, write us for our recommendations on the proper method and machine for your job.

**MATTISON**

**MACHINE WORKS**

ROCKFORD • ILLINOIS

# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

SEPTEMBER 15, 1955

VOL. 113, NO. 6

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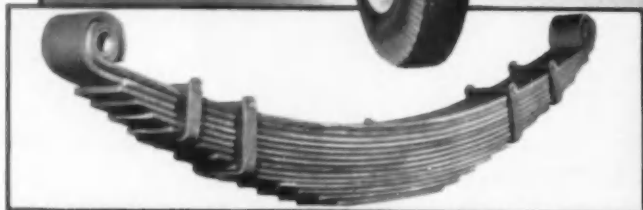


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# FOUNDATION FOR PROGRESS



**P**OWERFUL though they are, modern transport vehicles, on and off the highway, are subject to limiting factors of the roads they travel. How fast they may go, how well they ride, their stability on the road, the safety of their loads depends on the *springs . . .* the "foundations for progress".

Burton springs, supplied as standard equipment on White 3000 Series trucks are "foundations for progress" of all kinds of bulky and heavy products carried in these dependable vehicles.

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... Vital Support for the Automotive Industry ...

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## **BEST** buys ROAD RANGER®

***Reports higher speeds on hills,  
less driver fatigue, better trip time***

"You'll save time shipping the BEST way" is the well-known slogan of BEST MOTOR LINES.

To make sure they live up to their slogan, BEST owners are investing in modern tractors *with modern transmissions*: Fuller Semi-Automatic ROADRANGERS.

For 40 International R-195 tractors they purchased early in 1954, BEST specified Fuller R-45 ROADRANGERS . . . with 8 speeds forward in 38% steps, controlled by a single lever with a finger-tip range shift button.

BEST drivers report "the easiest,

fastest shifting we've ever seen. We're hitting the first 4 speeds every 3 seconds, and we don't even have to watch the tachometer. We're first away at the green light . . . and in the Ozark foothills, we're going up and over faster than we ever thought possible."

When you specify Fuller Semi-Automatic ROADRANGERS for your trucks, here are the advantages you can count on: • No gear-splitting—8 or 10 selective gear ratios, evenly and progressively spaced. • One shift-lever—complete control of ra-

tio selection. • Higher average road speeds—engines operate in peak hp range with greater fuel economy.

• Less driver fatigue—1/3 less shifts. • Range shifts pre-selected—automatic and synchronized. • More cargo on payload axles.

For complete information on the Fuller Semi-Automatic ROADRANGER Transmission, see your truck dealer. Or write to Fuller today.



**FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO, MICHIGAN**

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 2, Okla.

| WHAT            | WHERE   | WHY   |
|-----------------|---|---|
| SUNVIS 900      | In tight systems where oil is rarely changed and little or no make-up is needed.              | Exceptionally long life of oil keeps overall costs low.                         |
| SOLNUS          | In tight systems where make-up oil is less than 5% per month.                                 | Moderately priced... excellent stability and rust protection.                   |
| SUNTAC          | In leaky systems where make-up average is 5% or over per month.                               | Reduced leakage in systems cuts oil costs and downtime.                         |
| CIRCO           | In systems where oil is continuously diluted by water, cutting fluids and other contaminants. | Low-priced... excellent protection where oil must be changed frequently.        |
| SUNVIS H.D. 700 | In systems contaminated by dust and deposits of sludge, varnish, etc.                         | Cleansing action removes deposits and eliminates costly tear-downs.             |
| LUBEWAY         | In dual purpose systems of machine tools where hydraulic oil is also a way lubricant.         | Added film strength of this hydraulic oil also eliminates "stick-slip" on ways. |

## CHART SHOWS WHERE AND WHY SUN HYDRAULIC OILS SAVE MONEY

As the chart shows, to operate your hydraulic system at maximum efficiency and minimum cost you must consider the condition of your hydraulic system, as well as pressures, operating temperatures and other usual factors.

And, very important, you must consider the age of your system. Continued use of original oil recommendations can be costly. A change in the type of oil can often result in substantial savings... especially where systems have developed leaks or where sludge and varnish cause excessive maintenance.

For complete information about how Sun hydraulic oils can help you cut operating costs of your hydraulic system, see your Sun representative... or write SUN OIL COMPANY, Philadelphia 3, Pa. Dept. AA-9.



INDUSTRIAL PRODUCTS DEPARTMENT

**SUN OIL COMPANY** PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL



# NEW



## Tomorrow's oil seal here today in Victor Silicones

### Type K-6 Dual Lip Silicone Pinion Seal with Flange

Patent 2172325—Sept. 5, 1939  
Patent 2233902—Mar. 4, 1941

Superior bonding of Victor silicones to metal channel permits a strong, one-piece, leakproof construction. Internal lip retains lubricant; external lip excludes foreign matter. Valley in between the sealing lips is pre-lubricated for minimum friction. Cartridge-type flange allows ready removal of seal from housing without damage.



Here's the oil seal that makes a complete break with yesterday's sealing elements of tired leather, leather with additives . . . even steps out far ahead of synthetic rubber.

Here, Victor-developed silicones start a new era of automotive sealing progress, in highly engineered designs for tomorrow's tougher, more exacting needs. Tested as original equipment since 1953, Victor Silicone Seals were the first of their kind to merit approval by the auto industry.

Advantages of silicones, found in Victor's earliest pioneering of these compounds, have been developed to

the finest degree. Their suitability for high temperatures beyond 300 deg. F., and for high peripheral speeds, measurably exceeds that of conventional materials. They work well with the new lubricants. Throughout life, the element remains flexible and operative, does not harden or get brittle.

These premium seals can now be specified in the competitive market. Victor's skill in manufacturing—as in development—has led the way to large-quantity production at prices consistent with performance values. Your inquiry is invited.

# VICTOR Silicone Oil Seals

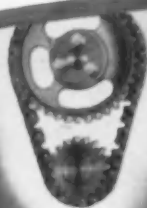
Victor Mfg. & Gasket Co., P. O. Box 1333, Chicago 90, Ill.

Sealing Products Exclusively • Oil Seals • Gaskets • Packings





**These LINK-BELT Timing Chains**  
are original equipment on 1955 automobiles



## And here's why: Link-Belt Timing Chain gives you



**1 AUTOMATIC JOINT SNUGNESS**



**2 SMOOTHER OPERATION**



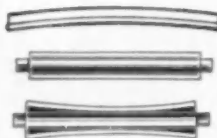
**3 LONGER LIFE**

**T**HE most important difference in today's timing chain designs is illustrated at right. Note how segmental bushings automatically compensate for wear... provide for complete joint snugness at all times. In action, Link-Belt gives you anti-whip, anti-back-bend chain—and more miles of quiet operation.

This advanced design is a product of the continuous research and advanced testing facilities in the world's largest chain plant. Let our engineers provide a test drive to your specifications. Or, for full information, get Book 2065.

19-747

Segmental bushings provide  
automatic joint snugness



Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

Bow in bushings acts to keep a snug joint on non-load side, maintaining chain pitch automatically.

**LINK-BELT**



**TIMING CHAINS AND SPROCKETS**

LINK-BELT COMPANY, 220 South Belmont, Indianapolis 6, Ind.



**Ross**  
**HYDRAPOWER**

• **INTEGRAL AND LINKAGE TYPES**  
**FOR EVERY POWER STEERING NEED**

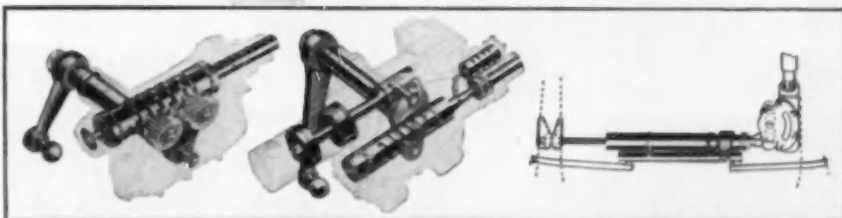
*Designed to make good vehicles better . . . Ross HYDRAPOWER is available in both integral and linkage types for every power steering need.*

*Effortless, fatigueless Ross HYDRAPOWER sets new standards of steering ease, safety and satisfaction . . . helps create customer goodwill for vehicles of many different types.*

**ROSS HYDRAPOWER** is backed by the accumulated knowledge and skills of 49 years of exclusive steering specialization. Ross invites discussion of any steering problem—power or manual.

**ROSS GEAR AND TOOL COMPANY, INC. • LAFAYETTE, IND.**

**STEERING**



**CAM & LEVER MANUAL • HYDRAPOWER INTEGRAL • HYDRAPOWER LINKAGE**

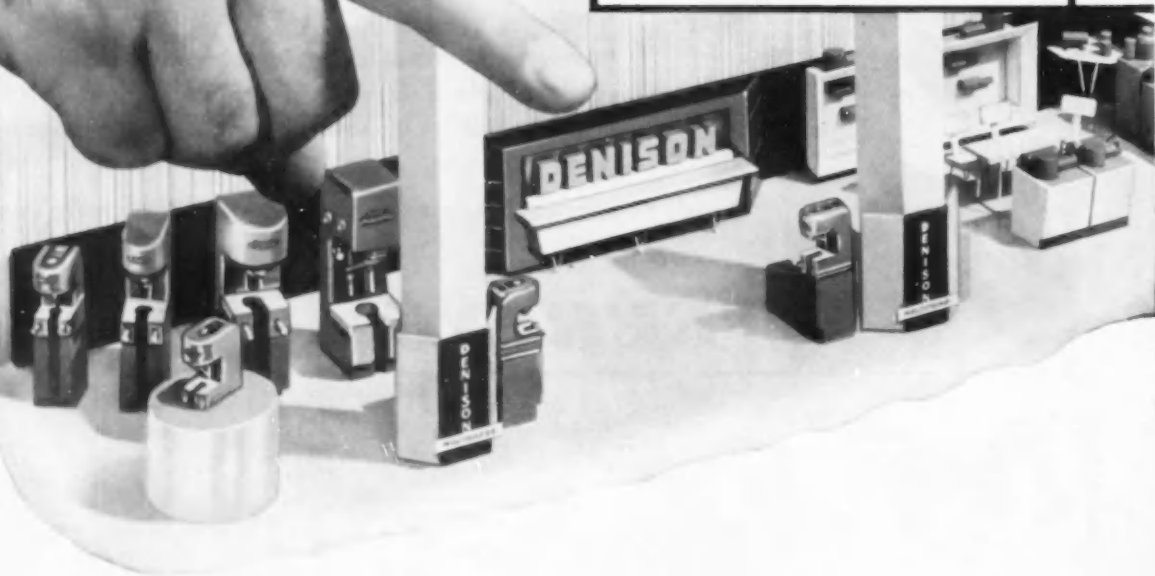
# TO FIND

## to hydraulic

**Multipump variable-volume vane pump.**  
Delivers variable volume at constant speed . . . constant volume at variable speed.



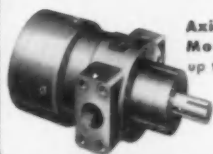
**Axial Piston Pump.**  
Variable volume, constant volume for pressures up to 5000 psi.



# THE ANSWERS

power—speed—control

VISIT US AT **BOOTH 819**



**Axial Piston Fluid Motor** for service up to 5000 psi.

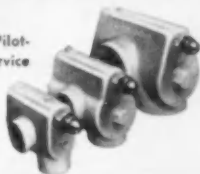


**Pressure Controls** Relief, sequence, unloading, pressure reducing valves. Pilot-operated for circuits up to 5000 psi.



**Multi-range Flow Control** for full range regulation on variable speed circuits. For service up to 3000 psi.

**Relief Valve.** Pilot-operated for service up to 2000 psi.



**Directional Control.** 4-way pilot-operated, solenoid-controlled for service up to 3000 psi.



**Pump-Motor.** Vane-type, continuous duty to 2000 psi with bi-directional rotation.



## WHAT'S YOUR PROBLEM?

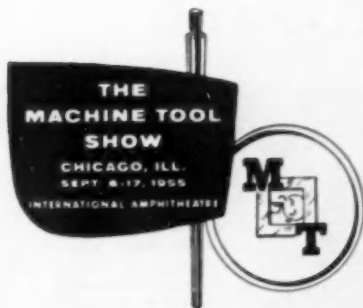
Let Denison help you solve it . . . at Booth 819.

As a machine tool builder, Denison is privileged to demonstrate and display its entire line of precision hydraulic pumps, hydraulic motors and controls.

As a designer of machine tools and automatic machinery, you obtain data on Denison's latest developments in hydraulics . . . at the same time you witness a full line of Multipress in action.

While you are at our booth, one of Denison's hydraulic engineers will gladly suggest how to simplify your circuits, build greater dependability into your hydraulics . . . and cut costs of hydraulic equipment.

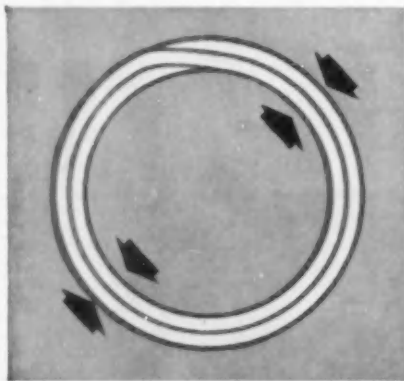
**THE DENISON ENGINEERING COMPANY**  
1212 DUBLIN ROAD COLUMBUS 16, OHIO  
*Subsidiary of American Brake Shoe Company*



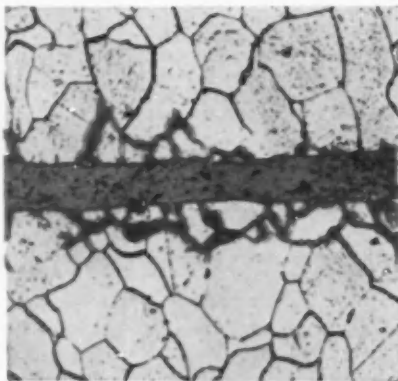
# Only Bundyweld steel tubing

## Here's why Bundyweld STEEL Tubing is used on 95% of today's cars

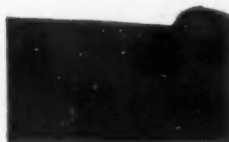
The illustrations below reveal why Bundyweld is specified by automotive manufacturers where strength and durability of tubing are essential. Bundyweld is the only tubing double-walled from a single metal strip. This exclusive process gives Bundyweld superior strength properties. Yet, because of the conditions under which Bundyweld is brazed and cooled, it is uniform and easy to fabricate.



With Bundyweld's beveled edges and single close-tolerance strip, there's no inside bead. The tubing is uniformly smooth, both inside and out. It fabricates easily; can be bent to short radii. Copper coating, inside and out, facilitates soldering and brazing operations.



This view of Bundyweld's copper bond (enlarged 300 times) shows how the copper actually alloys with the steel . . . through 360° of wall contact. That's the secret of Bundyweld's outstanding resistance to high pressure and vibration fatigue.



### WHY BUNDYWELD IS BETTER TUBING



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .



Bundyweld, double-walled and brazed through 360° of wall contact.



NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

# can take punishment like this!



When automotive manufacturers attempt to build a hundred thousand miles into their cars, they know they must use only the highest quality parts. That's why Bundyweld STEEL Tubing is used in 95% of today's cars, in an average of 20 applications each. Only STEEL tubing is tough enough, rugged enough to take constant wear and tear.

Extra-strong Bundyweld Tubing is specified for

hydraulic brake lines, to assure safe stops; for oil lines, to save costly repairs; for gasoline lines, to assure leakproof performance; for push rods, to produce more powerful overhead valve engines.

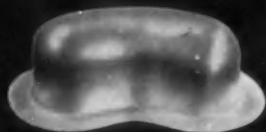
**Backed by expert technicians**, Bundy offers advanced fabrication facilities and prompt, dependable delivery. Let us help you with your tubing problems. Write today for additional information.

## BUNDYWELD TUBING®

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Peirson-Deakin Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Los Angeles 58, Calif.: Tubesales, 5400 Alcoa Ave. • Philadelphia 3, Penn.: Rutan & Co., 1717 Sansom St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave., South • Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., E. • Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.





One operation  
0.064" 2450 Aluminum



One operation  
0.051" 2450 Aluminum



One operation  
0.064" 6150 Aluminum



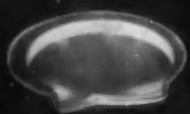
Drop Hammer combined with  
one Hydroform operation.  
0.064" 6150 Aluminum



One operation  
0.040" 7550 Aluminum

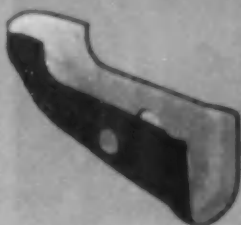


One operation  
0.025" RC70 Titanium



One operation  
0.051" 6150 Aluminum

4 CINCINNATI HYDROFORM  
MACHINES AT NORTH  
AMERICAN AVIATION, Inc.  
26" machine in foreground,  
12" machine in background.  
For a description of the  
Hydroforming process and  
specifications of the 8", 12",  
19", 23", 26", and 32"  
machine sizes, write for Bul-  
letin M-1759-3.



Two operations  
0.040" 6150 Aluminum



Two operations  
0.032" 5250 Aluminum



Three operations  
0.032" 6150 Aluminum



One operation  
0.051" 6150 Aluminum

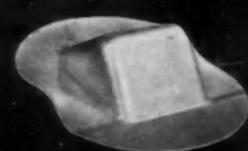


**Hydroform**

These are typical aircraft components produced on two Cincinnati Hydroform machines at North American Aviation, Inc. Hydroforming has increased their overall production of intricately-shaped parts . . . made from all types of materials ranging from aluminum to titanium . . . at very substantial savings in development and production time, in tooling, material and labor costs.

To determine if Hydroforming can produce similar savings for your manufacturing program, call a Cincinnati Milling field engineer.

PROCESS MACHINERY DIVISION  
**THE CINCINNATI MILLING MACHINE CO.**  
CINCINNATI 9, OHIO, U.S.A.



One operation  
0.064" 6150 Aluminum





# HUM

## SQUELCHED AT ITS SOURCE

—in Mallory's 25th  
Anniversary Vibrator\*

**R**EVOLUTIONARY design improvements in the latest model Mallory vibrator reduce mechanical hum to the lowest level ever attained in a commercial vibrator.

A look inside the vibrator will show you some of the new ideas that have gone into this outstanding product. Most important is a bell-shaped liner which holds the mechanism from the coil end, effectively isolating the vibrations of the reed element from the case and mounting plug. Combined with an improved design for the cup at the plug end, this liner keeps mechanical "shake" from being transmitted to the chassis regardless of the vibrator's mounting position.

*Parts distributors in all major cities stock Mallory standard components for your convenience*

**Serving Industry with These Products:**

Electromechanical—Resistors • Switches • Television Tuners • Vibrators  
Electrochemical—Capacitors • Rectifiers • Mercury Batteries  
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Even the lead wires have been re-designed to minimize transmitted noise.

The result is that this improved vibrator actually produces less mechanical hum than the electrical hum coming from the speaker of most auto radio sets.

Equally important to the designer, this premium performance is available *without* premium cost. Price is identical with previous Mallory models.

Plan to take advantage of this new standard of quietness in vibrator operation, in the new equipment you are designing or in circuits you now have in production. Our Technical Bulletin gives full electrical details . . . write to Mallory for your copy today.

\* Patent Pending

*Expect more . . . Get more from*



if the  
**TRUCK DEALER**  
built the  
trucks he sells—



# ZENITH

## CARBURETORS

would be *his* choice

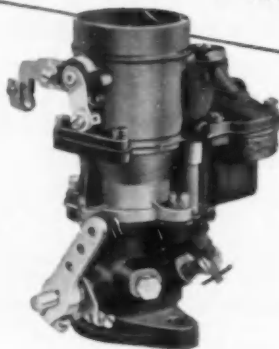
The successful truck dealer is in the business of selling customer satisfaction as well as retailing trucks. For it is obvious that unless a dealer enjoys a substantial volume of repeat business he is going to have trouble operating at a profit.

Therefore, shrewd truck dealers are vitally interested in the performance of such important components as carburetors. It is for this reason that the outstanding performance characteristics of Zenith® Carburetors, under every operating condition, have made Zenith the dealer's choice.

Therefore, it just seems reasonable that if truck dealers were engineering trucks for complete customer satisfaction, performance proven Zenith Carburetors would be their choice for standard equipment.

Further evidence why—if you build, buy, sell or operate trucks, Zenith should be your choice for the finest in carburetion.

\*REG. U. S. PAT. OFF.



**ZENITH CARBURETOR DIVISION OF**



696 Hurst Avenue • Detroit 14, Michigan • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

# Production Pointers from **GISHOLT**



TIME-  
SAVING  
IDEAS



*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.*

## HOW SPECIAL TOOLING SIMPLIFIES MACHINING OF STEEL DRIVE SHOES

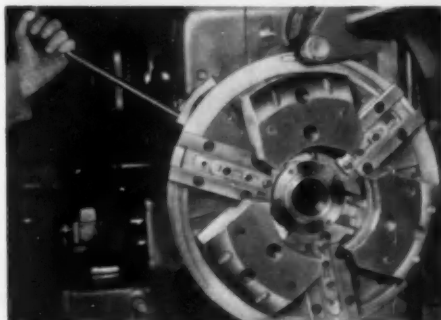
### Extra Chucking Eliminated with Smart Setup on Gisholt 2L Saddle Type Lathe

Sharpest thing about this "pointer" is the chucking arrangement to hold the part away from the chuck face to permit back facing and forming operations at the rear of the workpiece. Parts are 5", 6" and 8" steel drive shoe forgings.

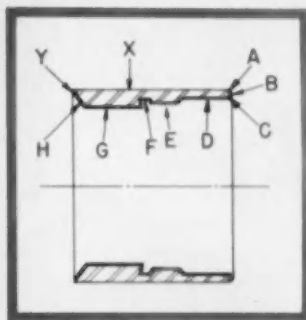
Workpieces are accurately located by means of retractable chuck jacks, which are mounted on special slides and actuated by a special cam plate on the chuck O.D. To chuck the part, a slight rotation of the cam plate causes the jacks to move in and work is placed against them at Y while chucking pressure is applied at X. (See drwg.) The jacks are then moved out to clear the part for machining. Extra-wide chuck jaws with driving pins center the part and distribute chucking pressures to avoid distortion.

Piloted tools on turret stations 1 and 2 rough and finish bore D-E-G and rough and finish form A-B-C. Special internal facing tools are mounted on the next three turret stations. These tools are actuated by feeding against a stop bracket mounted on the overhead pilot bar. F is formed from station 3; H is back-faced from station 4, and H is then formed from station 5. A collapsible tap, mounted on station 6, operates in conjunction with the turret threading attachment to thread E and finish the part. Floor-to-floor time on the 6" size drive shoe is only 7.9 minutes.

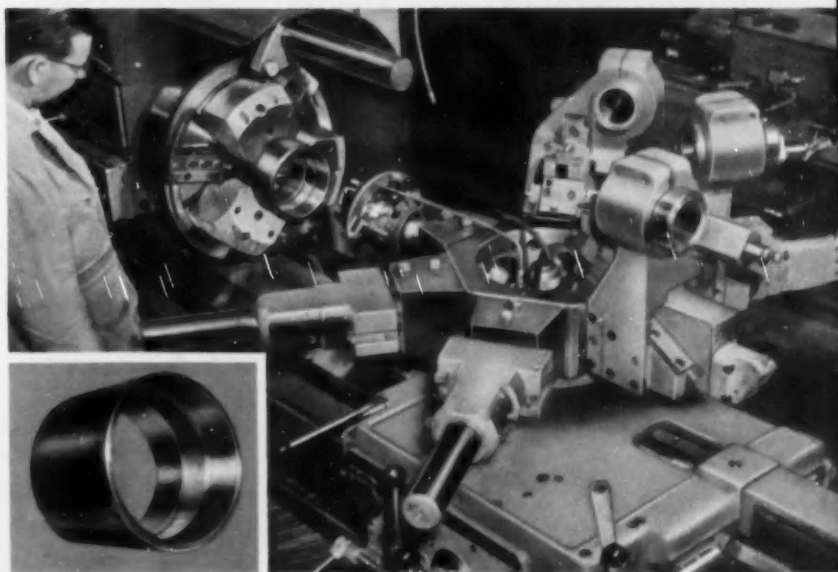
**Smart tooling arrangement makes it possible to complete each part in single chucking, including back-facing, forming, threading.**



Special cam plate to actuate retractable chuck jacks.



Drawing indicates surfaces machined.



Tooling setup shows station #6 in working position with collapsible tap ready to finish part. Inset shows finished drive shoe.



TIME-  
SAVING  
IDEAS

## A HOST OF NEW IMPROVEMENTS

### THIN-WALL PARTS EXPERTLY HANDLED WITH THIS SMART SETUP

#### Hex Turret on Ram Type Lathe Is Tooled for Double Operation to Minimize Tool Change-Over

Machining thin-wall parts—like this  $\frac{1}{4}$ " hollow drill—is always a ticklish problem. Here's how a leading producer is handling it in two fast operations, with a Gisholt No. 3 Ram Type Turret Lathe.

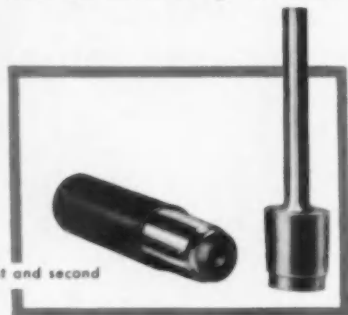
First operation: advance rough bar stock end  $1\frac{1}{2}$ " from face of collet and chuck. Form O.D. and face end with form tool in rear tool post. Start drill from hex turret. Rough and finish

drill bore with special pivoting tool holder—which carries both drills and mounts on single turret station. Ream bore. Then open collet, advance stock to length, re-chuck, and cut off from front tool post.

For change-over, insert special collet pads with built-in locating stops. Mount rear tool post with chamfer tool; place radius tool in front tool post. With hex turret tooling already in place and stops set, change-over is at minimum.

Second operation: Place piece in special collet; locate and chuck. Center end from hex turret. Chamfer end from rear tool post to provide accurate start for roller turners which reduce stock O.D. to  $\frac{1}{4}$ " in three passes. Form shank end radius, and the part is completed.

Only 3.6 minutes floor-to-floor time for the first operation and 1.3 for the second—that's ample proof that this kind of tooling pays off.



Workpiece, after first and second operations.

### SLIDE TOOLS STRADDLE FACE TO COMPLETE PART IN ONE CHUCKING

#### Pusher Arrangement on Fastermatic Handles Internal Machining, Back-Facing

Ordinarily, tooling up for this cast iron worm bearing carrier would indicate several chuckings—but with this setup on the 2F Fastermatic Automatic Turret Lathe, one chucking is all that's required. A 3-jaw air chuck holds the work at X, with location against the backface Y.

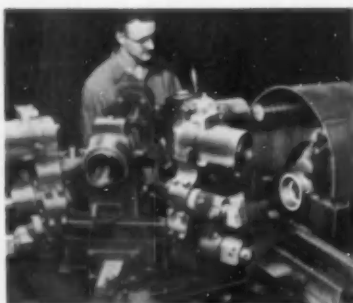
Here's the machining operation: tools on turret station 1 rough turn B, and rough bore F and J, while tools on front and rear cross slides rough and finish face A. Next, a pusher rod on the rear cross slide actuates a slide tool on turret station 2, which

carries tools to face and relieve G, chamfer H and rough face L. B is semi-finished turned from station 3, which also chamfers C and semi-finish bores F and J. Station 4 then finish bores F and chamfers E; another slide tool on station 5 finish faces L and chamfers K; station 6 finish turns B and finish bores J—and the part is completed—in a single automatic operation!

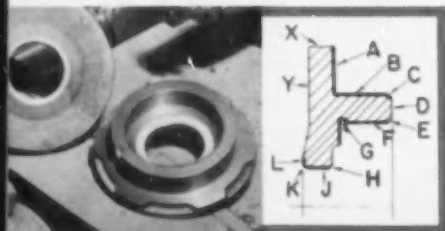
Here's steady low-cost production. Since the operator merely loads, starts and unloads the Fastermatic, he can easily handle two or more machines at the same time.

With this well-planned setup, 12 surfaces are machined in one fast, automatic operation, requiring only 4.4 minutes, floor-to-floor.

With this setup, floor-to-floor and change-over time are held to an absolute minimum.



Tooling setup, showing pusher bar on rear cross slide, with slide tool in foreground.



Cast iron worm bearing carrier, showing surfaces machined, front and back, in this operation.



LOOK AHEAD... KEEP AHEAD... WITH GISHOLT



TIME-  
SAVING  
IDEAS

## SPIN TUBS FOR AUTOMATIC WASHER BALANCED FOR SMOOTHER OPERATION

### DYNETRIC Balancer Handles Unusual Assemblies in Over- hanging Position; Simplifies Loading and Unloading

Here's a tip on how unusual assemblies can be handled—for either single or two-plane balancing operations—in an overhanging position on the same machine.

In the illustration, two different models of automatic washer spin tubs are shown. A and B represent a model designed for single plane balancing. C and D represent a model with a balancing ring added to the base, permitting two-plane balancing.

Using the Type 3S DYNETRIC Balancing Machine, the parts are mounted on an arbor which is never removed from the work supports. This simplifies loading and unloading. The parts are then balanced in an overhanging position, with the arbor counterweighted at one end to keep the center of gravity of the rotating assembly between the supporting bearings. Adequate hold down is assured by a full bearing on the left work support.

For tubs A and B, the operator uses one switch to indicate location and amount of unbalance for the single correction plane. For tubs C and D, two switches are used—one for each plane. Bolts, washers and nuts are used for correction—applied around the large diameter near the top of A and B, and in the two pre-selected correction planes illustrated for C and D. Each tub is rotated again for final check, and the job is done.

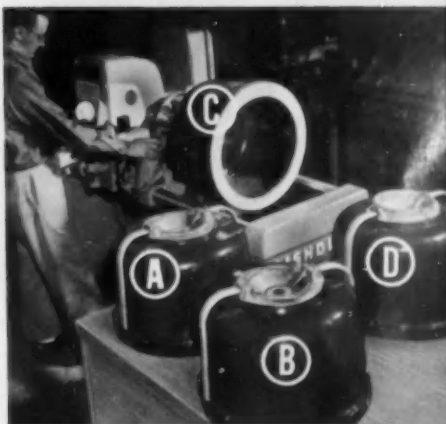


For two-plane balancing on C and D, weights are applied in two pre-selected correction planes.

For complete information and additional job applications, write for your free copy of the new Gisholt Type "S" Balancing Machine Catalog—ask for Form 1165-A.



The Gisholt DYNETRIC Balancing Machine simplifies handling of unwieldy parts—provides single or two-plane balancing, even with assemblies in overhanging position.



Either single or two-plane balancing is accommodated by the versatile DYNETRIC Balancing Machine.

## BEARING RACE PRODUCTION SPEEDED UP WITH NEW SUPERFINISHING MACHINE

### Both Inner and Outer Races Handled in Minimum Time

Here's how this manufacturer is increasing bearing race production (and bearing life) through the new Gisholt Model 79 Superfinishing Machine.

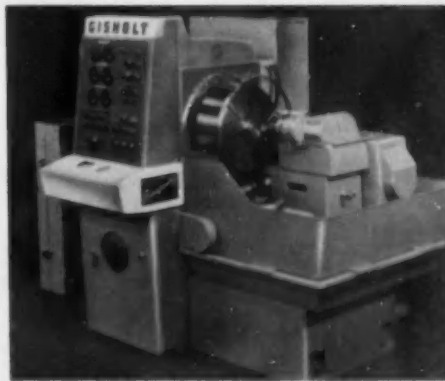
Providing maximum versatility, the new machine Superfinishes bearing tracks on inner and outer bearing races, and handles either straight or tapered bores of inner bearing races. The workpieces are Superfinished from a ground surface down to 3 to 5 micro inches RMS or less. For loading and unloading, the Superfinishing quill unit "tilts" away from the face of the 16" magnetic chuck. The quill unit is adjustable longitudinally, angularly, and for work diameters ranging from 1 1/4" O.D. to 15" I.D. or O.D.

The inner bearing race on the chuck has a 3 13/16" O.D., and is Superfinished in 35 seconds floor-to-floor.

For high production Superfinishing of inner and outer bearing races, nothing beats the new Gisholt Model 79 Superfinishing Machine.



Typical Superfinished parts handled on this high production equipment.



Dial controls independently adjust spindle speed, oscillation rate, travel and time for roughing and finishing cycles.







TIME-  
SAVING  
IDEAS



New Gisholt MASTERLINE No. 12 Automatic Production Lathe, tooling to machine and Superfinish brake drum.

## UNIQUE SETUP FOR DOING TWO JOBS IN ONE CHUCKING

*Automatic Lathe Machines and Superfinishes  
Brake Drum in One Automatic Operation*

Production men—always looking for ways to combine operations, reduce handling and save money—will be keenly interested in this tooling setup.

Using the new MASTERLINE No. 12 Automatic Production Lathe, the brake drum is chucked through the small bore on an air-operated draw-back type fixture. The operator clamps a vibration dampener around the O.D. and pushes the "start" button to begin the automatic cycle.

The I.D. is finish bored from the front carriage, which then tips toward the spindle centerline and relieves the boring tool. Then a Gisholt No. 2

Superfinishing Attachment—mounted on the rear independent slide—is fed into position. The brake drum I.D. is Superfinished from a turned surface down to 25 to 30 micro inches RMS. E.t.f. time is a short 1.5 minutes.

*Handling is reduced; closer tolerances are held, and the finished product improved by combining machining and Superfinishing on a MASTERLINE No. 12 Automatic Lathe.*

Write today for Advance Data Booklet No. 1175 for complete information on Gisholt MASTERLINE No. 12 Automatic Lathe; Booklet No. 1177 for No. 12V.

## RING GEAR PRODUCTION PROBLEMS SOLVED THROUGH SPECIAL TOOLING

*Alignment Concentricity and Fine Finish  
Simplified by Simplimatic Automatic Lathe*

Maybe there's an idea for you in the way this manufacturer solved some tough tooling problems with the right kind of setup.

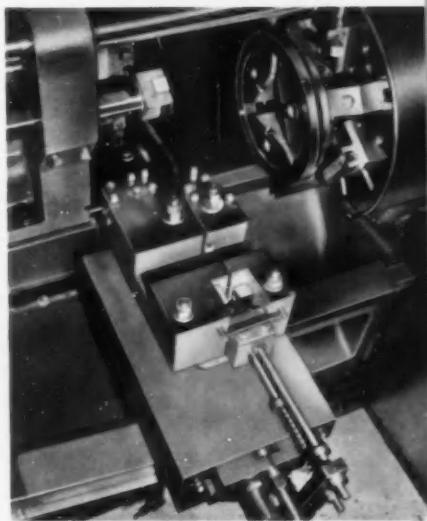
The part, a steel final drive gear forging, had to have both front and rear faces perpendicular to the bore. Distortion through chucking pressures had to be absolute minimum. Location had to be accurate against dead stops, yet the back face had to be machined. No tool tracks could be left on front and back faces.

Every problem is licked through this smart tooling on a Gisholt Simplimatic: to equalize chucking pressures, avoid distortion and simplify alignment; swivel-type pie-shaped jaws chuck the work in the previously machined I.D. Maximum rigidity

is assured through twin overhead pilot bars on a special boring head on the center slide. Clearance for straddle-facing and chamfering operations is provided by swinging jacks on the chuck face, which permit accurate location and swing out of the way. Tool tracks are eliminated by a special wedge-type tool relief arrangement on the rear slide. To bring the facing tools together, the wedge is engaged during the cut—then withdrawn to let the tool blocks spring apart for tool relief.

Floor-to-floor time? The job is completed in just 2.8 minutes.

*Smart tooling plus the versatility of the Simplimatic eliminated many special problems in machining this final drive gear forging.*



Close-up of workpiece and tooling. Note wedge-type tool relief arrangement on rear slide.

No. 9—1055

642



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

# GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

new engines...

new brakes...

new suspensions...

AND NOW

# NEW PISTON RINGS

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METAL!



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**MUSKEGON**  
Piston Rings

MUSKEGON PISTON RING CO.  
BUSHROCK, MICHIGAN  
PLANTS AT MUSKEGON AND SPARTA

*First From Muskegon!* Just as you might expect, this major development in piston rings, necessary to keep pace with other automotive improvements, has come from the Muskegon Piston Ring Company.

This significant new approach to piston ring manufacture makes use of powder metallurgy... thousands of years old and now a major part of metallurgical technology. New Muskegon sintered metal rings provide highly improved scuff resistance and wear resistance. Previous limitations on size and configuration, found with conventional cast iron rings, are largely eliminated. Muskegon sintered metal rings can be designed to provide entirely new cross-sections... can be made much narrower to lower friction and provide lower weight and less inertia. Compression rings of only  $\frac{1}{16}$ " width are practical.

These new rings can be manufactured to closer tolerances and more accurate measurements... the metallic content can be closely controlled. Their "built-in" porosity provides thousands of tiny oil reservoirs that increase lubrication retention. Because they are stronger than cast rings and have an improved modulus of elasticity, sintered metal rings give assurance that they will not break because of fatigue or over-stressing.

Here's the big question, cost! In spite of the fact that they provide dramatic superiority over ordinary rings and give new design opportunities, Muskegon sintered metal rings offer the possibility of lower cost.

Since 1921... The engine builders source!

DETROIT OFFICE: 521 New Center Bldg.  
Telephone: Trinity 2-2113





PHOTO COURTESY NORTH AMERICAN AVIATION, INC.

## How to take a jet's pulse . . . six miles up

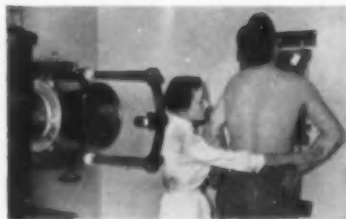
Picture 36 men with notebooks and pencils perched on the wings of this jet—busily recording stresses and pressures as the Super Sabre roars through its supersonic, miles-high test flights. That's the kind of job done *photographically* at North American Aviation with an oscillograph recorder.

Sensitive pickups on vital parts of the aircraft send data to the recorder. There this data is translated into light and recorded on a photographic paper, Du Pont "Lino-Writ" W. Engineers choose "Lino-Writ" W because it's strong and remarkably sensitive, and so thin that many feet of it can be fitted

into compact recording equipment.

"Lino-Writ" W records engineering data in many fields—in mass spectrometry, in many types of aircraft, in guided missiles, in the automotive industry. Want more information on this versatile oscillograph recording paper? Just mail the coupon, below.

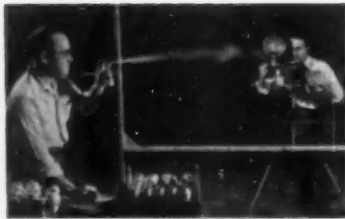
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**PLANT EFFICIENCY** is no higher than the health of your employees. Regular checkups of lungs and spine, on Du Pont X-ray Film, help keep efficiency up, sick leave down.



**KEEP FILING COSTS DOWN** by making photocopies on thin Du Pont "Photo-Writ" W (right). Both folders hold 200 photocopies—but "Photo-Writ" W is up to 60% thinner.



**TESTING PRODUCT PERFORMANCE** with high-speed "Superior" Press Film. Here, dispersing action of aerosol spray nozzles is recorded *photographically* for design study.

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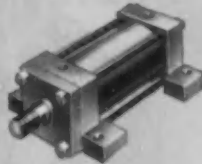
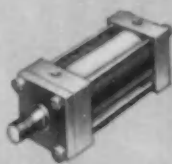
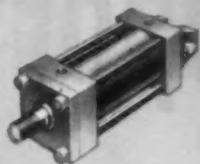
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☐ Please have your Technical Representative call.

189

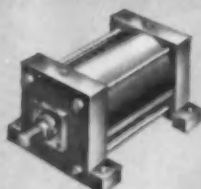
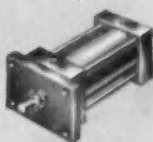
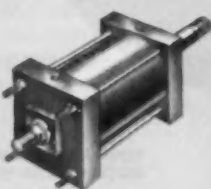
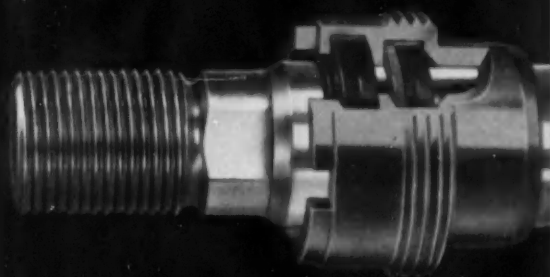


### Series "H" Hydraulic Cylinders

9 bore sizes from 1½" to 8"...13 standard mountings, many combinations. Heavy-duty tie rods. Steel heads. Steel cylinder bodies "Tru-Bored" and honed to a satin finish. Piston rods ground and polished, then hard chrome plated for minimum friction and long packing life.

### Series "A" Air Cylinders

11 bore sizes from 1½" to 14"...13 standard mountings, many combinations. Steel heads. Cylinders of hard-drawn, high-strength brass, honed to a satin finish. Piston rods ground and polished, then hard chrome plated for extreme smoothness as well as corrosion resistance.



## Only HANNIFIN Square-Type Cylinders Have This Revolutionary New Gland

The gland you see here represents the biggest improvement in cylinder design in the last 50 years. And, you'll find this gland only in Hannifin Square-Type Air and Hydraulic Cylinders.

This exclusive Hannifin Gland is a bronze cartridge, *externally removable and replaceable as a unit* to meet J.I.C. recommendations. The packing is new, too. Outside is the "Wiperseal." It serves a dual purpose as it *wipes both ways* to pro-

vide a dry rod on the out-stroke, a dirt-free rod on the in-stroke. Inside is the "Lipseal"...self-compensating, self-relieving and nonadjustable. It provides an efficient seal throughout its long life.

Find out how easily you can apply Hannifin Cylinders to your requirements. They're available for prompt delivery—in all sizes and all standard mounting styles—and at competitive prices despite all their exclusive features.



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Bulletin 113, Series "H" Hydraulic Cylinders

Bulletin 213, Series "A" Air Cylinders

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# Report

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by inflating or gauging application . . .

## OPENS VALVE

to provide . . .

## FAST FLOW

of air through tire valve

TR500 SERIES CLAMP-IN  
TRUCK TUBELESS VALVE

## THE STANDARD SCHRADER VALVE CORE

springs shut immediately upon removal  
of inflating chuck or gauge and seals  
air in.

TR500 SERIES CLAMP-IN TRUCK TUBELESS TIRE VALVE

SIX LENGTHS  
now standard on  
deep-center rim  
with side mounting  
valve stems,  
up to 12 inch size.

# Schrader

ESTABLISHED IN 1844

# on Truck Tubeless Tire Valves

## An Industry Development Keeping Abreast of Transportation Progress

Truck tubeless tires are here. Recent approval of certain rim designs by the Tire and Rim Industry gives truck tubeless the green light. Commercial vehicle manufacturers indicate that tubeless tires will be mounted increasingly on 1956 models.

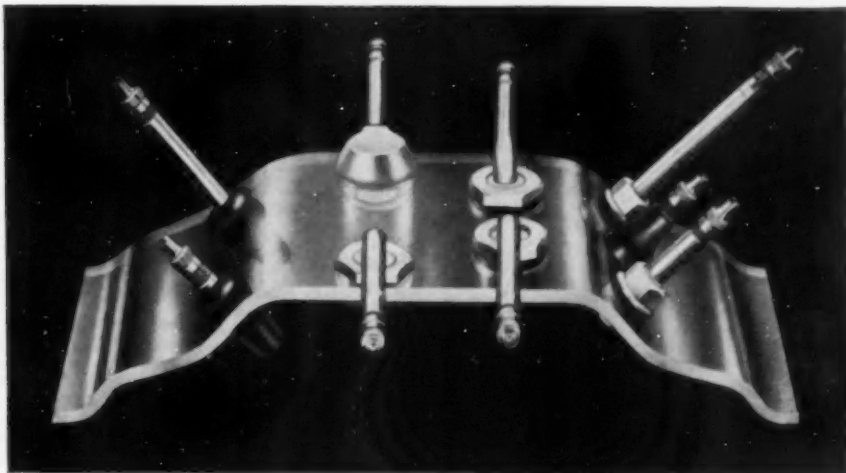
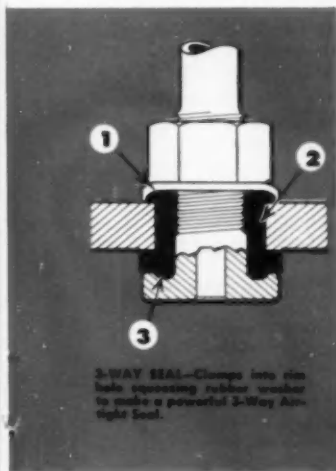
The Tire and Rim Industry-approved TR500 series of Clamp-in Valves are now being manufactured in volume and are going on a large number of truck rims. The clamp-in principle of attaching the valve to the rim does not alter the method of putting air in the tires. It continues to be the tire inflation principle developed by Schrader over 50 years ago—as described on the opposite page.

Eventually most vehicles will run on tubeless tires. The changeover will take place as soon as Industry rim-valve-tire requirements, now on test, are standardized for different vehicles. Because of Industry cooperation in the development, testing and production of *all three*: a better valve, better rim, better tire . . . motor vehicle transportation continues to improve!

As new problems are faced in tire valve development, you can be sure Schrader will continually be helping with research, design and production to provide quality valves that fit the job.

TR500 SERIES  
CLAMP-IN 3-WAY SEAL

TYPICAL TUBELESS TRUCK VALVES IN ACTUAL USE OR ON TEST.



**A. SCHRADER'S SON**, Division of Scovill Manufacturing Company, Incorporated  
470 Vanderbilt Avenue, Brooklyn 38, New York

FIRST NAME IN TIRE VALVES

FOR ORIGINAL EQUIPMENT AND REPLACEMENT

AUTOMOTIVE INDUSTRIES, September 15, 1955

# moraine engineering



A new and improved spacer for shock absorbers that is now being made in one press operation—with substantial economies for a Moraine customer.

## Amazes even engineers!

People sometimes find it hard to believe us when we tell them that parts like these can be made from metal powder in one press operation. Then they're amazed to see us make these and other equally complicated parts easily, economically, in quantity. And when they learn about the over-all advantages — *Improved product performance . . . Lower unit cost . . . Dependable, on-time quantity delivery . . . Engineering assistance . . . Savings in customer*

*investment in equipment and floor space* — they are convinced that Moraine engineering and metal powder techniques may offer real solutions to their own problems.

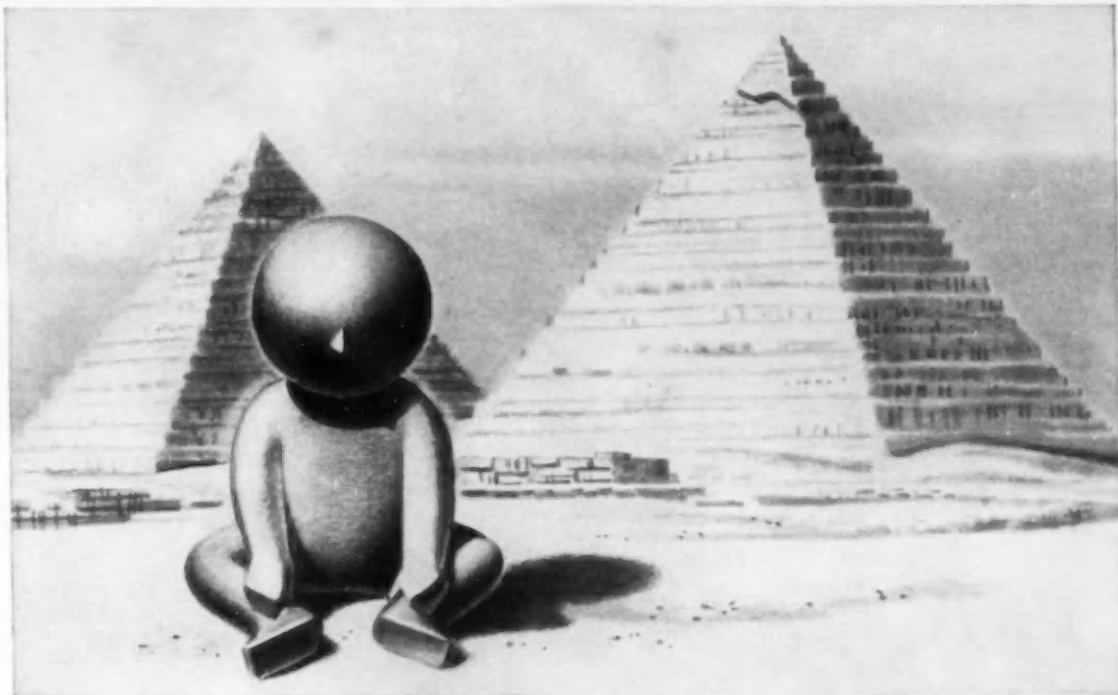
*Moraine products include: Moraine-400 bearings, toughest automotive engine bearings ever made — Moraine friction materials — Moraine metal powder parts — M-100 engine bearings and Moraine conventional engine bearings — Self-lubricating bearings — Moraine porous metal parts — Moraine power brakes — Delco hydraulic brake fluids — Delco master cylinders, wheel cylinders, lined brake shoes and parts.*



**moraine  
products**

DIVISION OF GENERAL MOTORS, DAYTON, OHIO

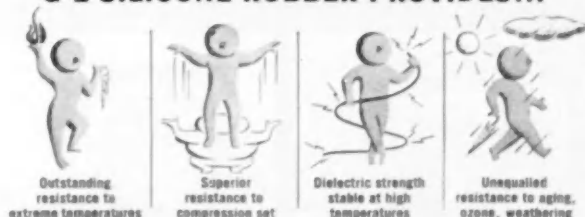
# How can you benefit from the AMAZING DURABILITY of G-E SILICONE RUBBER?



**Amazing durability**—through exceptional resistance to aging, ozone, and weathering—is among the outstanding characteristics of General Electric silicone rubber. For example, G-E silicone rubber provides *virtually ageless insulation* for transformers and turbine generators. It makes aircraft seals which are *unaffected by weather or by ozone concentrations* at high altitudes. If *durability* is what you need in rubber parts, specify General Electric silicone rubber!

**Where can YOU use G-E silicone rubber?** There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression of *any known rubber*! Class 500 provides flexibility at *-130 F below zero*! Which class is best for you?

## G-E SILICONE RUBBER PROVIDES...



G-E silicones fit in your future

**GENERAL  ELECTRIC**

## SEND FOR A FREE "LIGHTNING SELECTOR"—TODAY!

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Please send me technical data on G-E silicone rubber, including a free "Lightning Selector" and up-to-date list of fabricators.

Name \_\_\_\_\_ Position \_\_\_\_\_

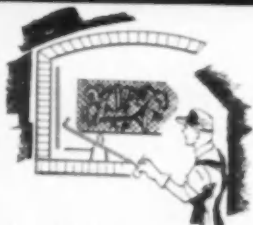
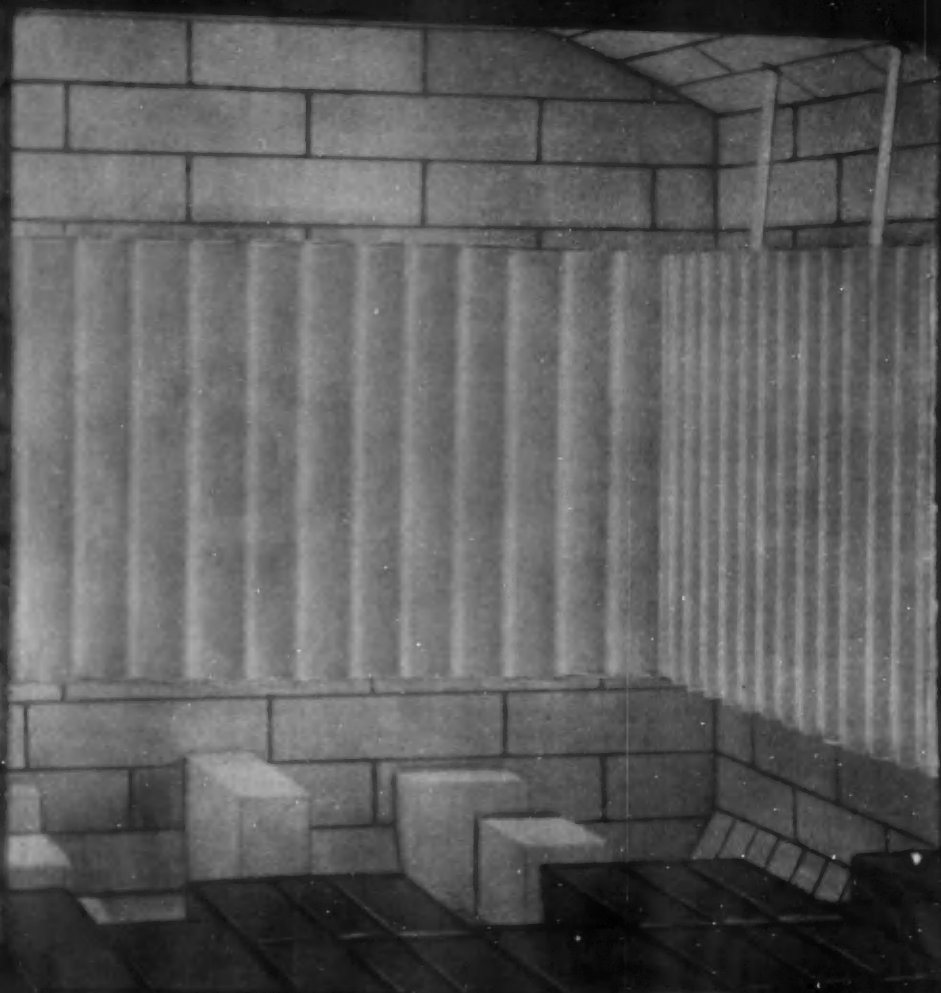
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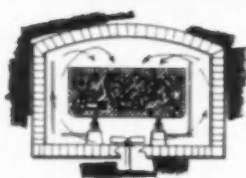
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IN CANADA: Mail to Canadian General Electric Company, Ltd., Toronto

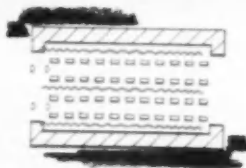




Safety! Extremely low voltage makes CORRATHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt.



CORRATHERM elements act as natural baffles to direct forced convection streams through the charge. The use of electric furnaces for carburizing and carbonitriding is now practical.



In continuous type furnaces CORRATHERM elements hang between lines of work as well as on side walls. Note how closer corrugations (at each end of element) compensate for incoming cold work and door losses.



# NEVER BEFORE ANY ELECTRIC ELEMENT LIKE THIS NEW ONE BY LINDBERG

On the opposite page is a photograph of Lindberg's new CORRATHERM element for electric heat treating furnaces. You can see how radically advanced this element is over anything now used.

Wherever electricity is the preferable source of heat for metal treating the CORRATHERM element now makes its use practical, efficient and economical.

And this includes carburizing and carbonitriding furnaces, too! Problems created by the use of electricity in these types of furnaces are well known. CORRATHERM elements eliminate them completely. These facts tell you how and why:

**LOW VOLTAGE:** Operates at extremely low voltage. No leakage through carbon saturation. Around Lindberg we talk about it as the electric element "without any electricity...to speak of!"

**ATMOSPHERE CIRCULATION:** Elements act as baffles to direct circulation of convection streams.

**SAFETY:** Extremely low voltage also eliminates shock or short hazards.

**DURABILITY:** Watts density at all-time low. Element practically indestructible. Work load or operator's charging tool can't hurt it.

**EASILY INSTALLED:** Element is not enclosed, just hangs in furnace. No complicated mountings required.

CORRATHERM, Patent No. 2694740 (other patents pending), was developed in Lindberg laboratories, by Lindberg metallurgists and engineers. To find out just how its advantages can be applied to your heat treating processes get in touch with your Lindberg Field Representative. (See classified phone book.)

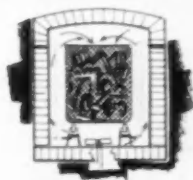
## LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 Regentview Ave., at Downey, California



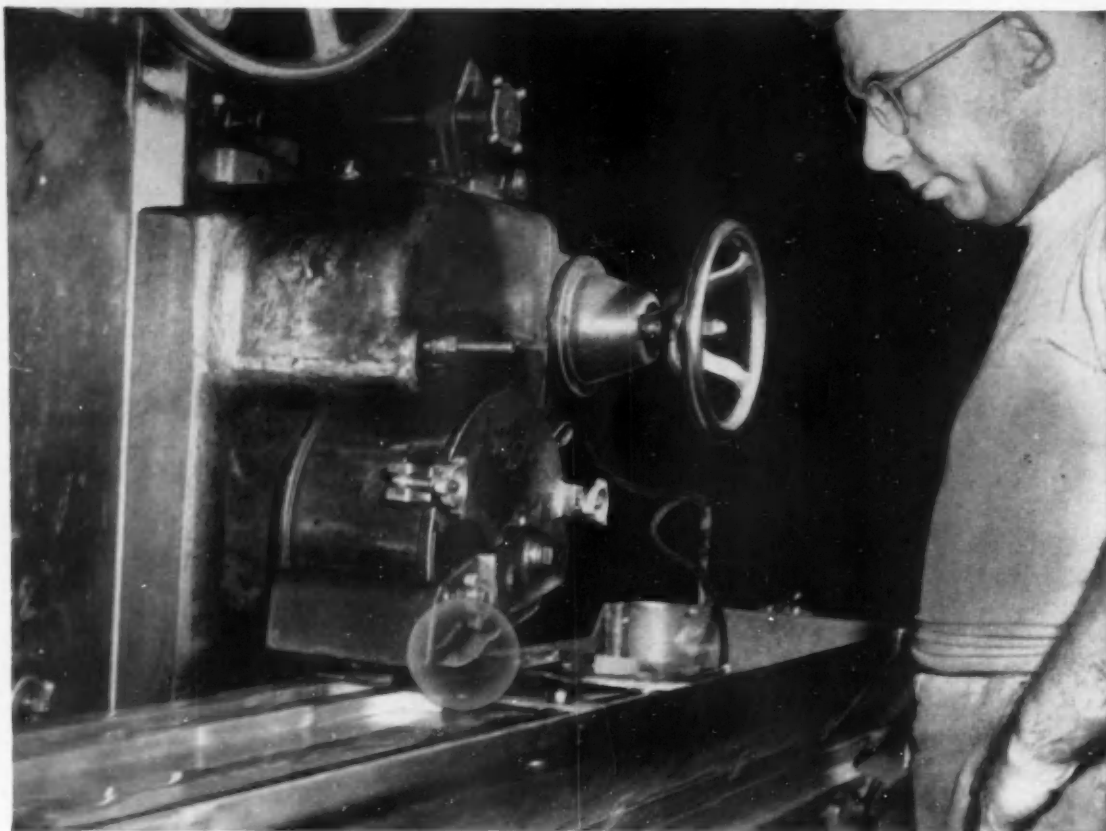
If you are in Chicago during the period of the three shows, September 6 to 16, plan on attending one of the special showings of this new element at our plant. Just phone MOnroe 6-3443 and we'll make the arrangements.



No retort needed in pit-type carburizing furnace with CORRATHERM elements. Again see how elements serve as baffles to direct forced convection stream through charge.

# CORRATHERM

by LINDBERG



**"Competitive wheels have never equalled G Bond wheels on our jobs."** This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, besides being extremely free cutting, requiring very little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001". The machine is a Norton 10" Hydraulic Surface Grinder.



## Better surface grinding for you . . . G BOND users' reports prove it!

*Top speed, new economy among many  
"TOUCH of GOLD" advantages listed*

Reports from surface grinding customers on the performance of G Bond wheels sound pretty much alike. That's logical, because each customer is getting exactly the advantages he's looking for — *freer, cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.*

**Your Own Surface Grinding**  
will benefit by the G Bond's unique abil-

ity to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage that means time and money saved, plus better product quality, throughout the range of precision and semi-precision grinding jobs.

### **See Your Norton Distributor**

for the G Bond wheels, cylinders and segments you need. They're available in a variety of famous Norton abrasives. Of these, 32 ALUNDUM\* abrasive is particu-

larly suited for fast stock removal and heavy feeds — it grinds exceptionally cool and fast, with minimum dressing. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.



*Grinding precision spur gears of SAE 8620 steel, hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.*



*"Norton G Bond wheels are faster and freer cutting, need less dressing than any other wheels we've used," says this Pennsylvania metal working company. Material ground is boiler plate and miscellaneous steel plate. Stock removal rate is 4.5 to 6 cubic inches per minute.*

W-1644



*Jigs, fixtures and other parts of miscellaneous steels, besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.*

\*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



*Making better products...  
to make your products better*

**and its BEHR-MANNING division**

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories  
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



## When SPECIFY REPUBLIC



Paint really adheres to Republic Electro Paintlok sheets. And rust is shut out. That's why these National Biscuit Company truck bodies are made of this zinc-plated steel sheet that's chemically treated to take paints, lacquers, synthetic enamels—and hold them for years. Tight zinc coating guards against underfilm corrosion and creeping rust. Manufacturers find production costs go down when they use these special sheets that hold paint longer and make products look better.



ELECTRUNITE Mechanical Tubing makes some products possible (like this ball bushing for linear motion by Thomson Industries). Problem here was close tolerance tubing to house bearings and raceway, plus tough wear by bearings at contact points. Republic ELECTRUNITE Tubing supplied all these advantages along with good surface conditions; good dimensional control, both I.D. and O.D.; uniform wall thickness; uniform concentricity; uniformity to withstand heat treating.

This rear axle assembly must withstand shock and vibration at high speeds. Republic "Nylok" Nuts are used to assure positive locking even under severe vibration. The nylon plug in one face forces the nut tight against the opposite threads of the stud as the nut is turned on.

Republic "Nylok" Nuts lock whether seated or not. They go on easily. Either end is up. Feed them automatically at full production speed. Or manually for piece-work. No special tools, lubricants or techniques are needed.

They cut maintenance costs, too. Republic "Nylok" Nuts are easily backed off for inspection of parts. And, then can be re-used.

## REPUBLIC

*World's Widest Range of Standard*



# vibration is a problem...

## "NYLOK" NUTS!

### 12 WAYS BETTER

Assemble from either end • Can be re-used • Non-galling • Best wrenching characteristics • One-piece • Cold-forged • Won't damage threads • No special tools • Lock in any position • No special know-how • No lubricants needed • Ideal for mechanical feeding

### SIZES

Finished Series tapped  $\frac{1}{4}$ " through 1"

Finished Thick Series tapped  $\frac{1}{4}$ " through  $\frac{1}{2}$ "

Heavy Series tapped  $\frac{1}{4}$ " through 1"

Write for a sample indicating size required.

"Nylok"® Nuts are only one of more than 20,000 types and styles of high quality fasteners made by Republic for all industries.

\*U. S. Pat. No. 2,462,603 and No. 2,450,694 and pending applications.

## STEEL

*Steels and Steel Products*



These gears were made at less cost from Republic Cold Drawn Special Sections. Much of the machining was eliminated because the sections already were formed to the predominating cross-section of the part. Parts benefit from the increased physicals produced by cold drawing. The bright smooth finish rarely requires further machining. Send samples or blueprints of your parts. We will tell you whether you can save money—and how much—by making your steel parts from Republic Special Sections.

**REPUBLIC STEEL CORPORATION**  
3106 East 45th Street,  
Cleveland 27, Ohio



☐ Please send a sample "NYLOK" Nut Size \_\_\_\_\_  
Please send literature on: ☐ Cold Drawn Special Sections  
☐ Electronite Mechanical Tubing ☐ Electro Paintlok Sheets

Name \_\_\_\_\_ Title \_\_\_\_\_

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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

R. 1007A

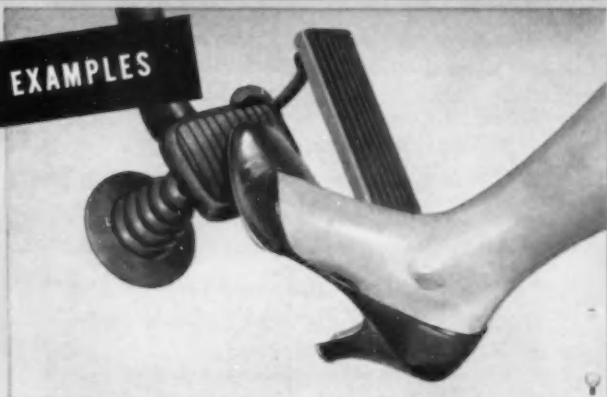


# Bendix Products Division

A GOOD RELIABLE SOURCE FOR AUTOMOTIVE COMPONENTS



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**BENDIX LINKAGE TYPE POWER STEERING**—Because Bendix\* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

**BENDIX LOW PEDAL POWER BRAKE**—Specified by more car manufacturers than any other make, Bendix\* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety.

\*REG. U. S. PAT. OFF.

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AVIATION CORPORATION



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## High Spots of This Issue

### ★ Parts Handling in Hydraulic Valve Lifter Plant

Diesel Equipment Div. of General Motors, spurred by a strong demand for hydraulic valve lifters and other special products, has expanded and mechanized its operations considerably. Various aspects of the program are covered here. Page 52.

### ★ World's Largest Plating Facility is Fully Automatic

Through use of a plating system designed and engineered by George L. Nankervis Co., the Chevrolet Livonia (Mich.) plates thousands of vehicle bumper sections a day. This article describes the set-up and the varied operations. Page 56.

### ★ Newest Automatic Equipment in Plymouth Engine Plant

Additions to the former Chrysler Mound Rd. plant have brought Plymouth V-8 engine production facilities to an area of 534,000 sq ft with an eventual capacity of 3000 engines a day. Many automatic features have been installed there. Page 60.

### ★ Soviet Systems for Design and Production of Aircraft

Inasmuch as designing of aircraft is intertwined with their production, this tenet has been followed rather religiously by the Russians in their aviation planning. How the U.S.S.R. adheres to the precept is illustrated here. Page 62.

### ★ Redesigned Cut-Up Lines in Body and Frame Plant

The automobile industry has seen much activity recently in the redesign of cut-up lines for body and frame stamping plants. One of the first to be completed is at Parrish Pressed Steel Div. of Dana Corp. for handling work. Page 70.

### ★ 44 New Product Items

#### And Other High Spots, Such As:

Aluminum honeycomb machining; helicopter turbo gas generator; valve tappet; car part seaming stitches; Chrysler line preview; electronic misfire counter; dream cars; Swiss tank; new Renault; and propane for lift trucks.

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AUTOMOTIVE INDUSTRIES COVERS  
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES  
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY  
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT  
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT  
ENGINEERING • PRODUCTION • MANAGEMENT

# What's New

## IN STEEL FROM STOCK

In the news today are many developments of interest to those who specify, buy or work with steel. Ways in which you can raise efficiency and lower costs in your operations may be suggested by the following summary.

Leaded plates—Now lead has been added to E-Z-Cut plate. As a result, E-Z-Cut, which was already considered one of the best free-machining plates on the market, is better than ever. Tests show that New E-Z-Cut cuts even faster, takes a sounder weld and polishes to a better finish than non-leaded E-Z-Cut. And because sulphur content is much lower, New E-Z-Cut is much cleaner steel, free from sulfide stringers. First stocks include thicknesses up through 3".

Biggest stainless steel plates now available from Ryerson stocks. This is the first time that 96" wide plates in thicknesses up to and including 1"—and heavier plates in 80" widths have been carried in stock at plants from coast to coast. Types on hand: 304, 304L, 316 and 316L. Next time, save welding on your big jobs with these bigger plates.

Delivered prices on tubing—Something new in simplified pricing is featured in a booklet just published by Ryerson. For buyers in the 16 metropolitan areas where large Ryerson tubing stocks are located, the booklet gives total delivered prices. There's no figuring to do—no factors to add. For buyers outside these metropolitan areas, a separate book gives prices per 100 feet and transportation charges. And beside every price in all books is a figure that tells you quickly and clearly when you can get a lower price by ordering just a few feet or pounds more. Copies on request.

Give steel-walled buildings a new look with stainless steel siding in mansard pattern, now available for quick shipment from Ryerson. (Galvanized and carbon steel sheets in mansard pattern also available.) The mansard pattern of widely spaced corrugations makes an unusually attractive wall and loss in total sheet area from pattern formation is slight—only about the same as with 2½" corrugated—previously the most economical pattern you could use. Maintenance-free stainless in mansard pattern also has many industrial and miscellaneous-architectural-ornamental applications. New Bulletin 70-5 on request.

New sizes of leaded alloys—Increasing demand for New Rycut 50, fastest machining .50 carbon alloy steel, has prompted Ryerson to increase the range of sizes in stock. Hot rolled rounds, both annealed and heat treated, are now available in large sizes—up through 9½". So heavy shafting, gears, cams, etc. can be produced at savings possible only with Rycut alloys.

Stainless pipe for welding applications—Now there's no need to wait for mill deliveries or to use expensive stabilized types when you want stainless pipe suitable for welding. Type 304L pipe, an extra low carbon type that eliminates the need for stress relieving after welding, has recently been added to Ryerson stocks. Size range: Schedule 40 welded pipe in commonly used sizes from ¼" through 2". Schedule 40 seamless in 3", 4" and 6" pipe sizes.

Supply situation on bars, structurals, plates and sheets—Heavy demand makes it difficult to keep all sizes of these products always on hand. However, we do have thousands of tons of steel ready for quick shipment and, since our stocks are being replenished continually, sizes that are not available today may be on hand tomorrow. So call us next time you need steel.



JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • CLEVELAND  
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# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 113, No. 6

September 15, 1955

## Lincoln To Consolidate Operations In New Plant

As indicated earlier, Ford will build an assembly plant for the newly organized Lincoln Div., which was separated from Mercury several months ago (see AI, May 15, p. 37). The company has taken an option on 325 acres of land in Novi Township, northwest of Detroit, and will construct a combined assembly plant and general office building, which is expected to have an annual payroll of between \$25 million and \$30 million when in full operation.

The new plant is part of Ford's latest \$625 million expansion program, which may also give the company another new assembly facility for the plush Continental car, due out in October. To occupy approximately 1.5 million sq ft of space, the Lincoln plant is scheduled for completion in 1957.

All Lincoln manufacturing operations now located in Wayne, Mich., and Los Angeles—would be consolidated in the new plant when it is completed. The facility would employ between 4000 and 5000 persons.

Simultaneous with the announcement of the new Lincoln plant, Ford revealed that it will erect a multi-million dollar building in Dearborn to house the activities of a new advanced product study and engineering research office. To be known as the Scientific Laboratory and Research Building, the new unit will provide more than 300,000 sq ft of floor space. It is also scheduled for completion in 1957.

## Safety Belts Planned By GM For 1956 Cars

General Motors reportedly will go along with the rest of the industry in offering seat belts as dealer installed equipment on 1956 models. It



## SIGHTSEEING AND CHARTER BUS NOW IN SERVICE

The Sightseer is now being produced by Fitzjohn Coach Co. as a new bus for sightseeing and charter service. A special adaptation of the Fitzjohn Road-Runner, is available in 33 to 41-passenger capacities. Reclining seats and air conditioning are optional. There is also a choice of gasoline or Diesel engine.

is no secret, however, that GM still has strong doubts that seat belts will be as helpful in preventing injuries as some advocates believe, and also about whether the passengers will use them if installed.

## Fruehauf Will Produce Clark Mobilvan System

Fruehauf Trailer Co. has been granted exclusive manufacturing and distribution rights for the Clark Mobilvan System. The system, a method for transporting large container shipments of merchandise, was introduced early this year. (See AI, March 1, p. 14.)

Under terms of the new agreement, Fruehauf will manufacture the vans at its various plants and Clark will produce locking mechanisms, for Fruehauf, at its Battle Creek, Mich., plant. The Mobilvan System will be marketed through Fruehauf's nation-wide network of factory branches.

## Two-Door Seville Hardtop To Be Offered by Cadillac

A more costly two-door hardtop will make its appearance in the 1956 line of Cadillac cars. Called the Eldorado Seville, the car will embody all the styling features of the present Eldorado convertible and will sell in the same general price range as the convertible—between \$6800 and \$7200.

The price is expected to include as standard all equipment which is considered optional on other models. The new model will bring to three the number of two-door hardtops Cadillac will offer for 1956.

## Federal-Mogul Sales, Net Up In Six Months

Earnings of Federal-Mogul Corp. in the first six months of this year climbed to \$2.36 million from \$1.67 million in the like 1954 period. Sales amounted to \$22.45 million, compared with \$18.57 million last year.

# News of the AUTOMOTIVE



*Illustrated here is the Ford F-750 truck model of 21,000 lb GVW. Chassis is equipped for 7½ to 19-ft bodies and is available with 132, 144, 156, 175 and 192-in. wheelbases.*

## **Chevrolet To Build Trucks In Willow Run Structure**

Chevrolet will convert its Willow Run warehouse into a truck assembly plant. The plant will go into production early next year and employ about 700 persons. Originally built by Henry Ford for assembly of bombers in World War II, the 479,000 sq ft building is located on a 101-acre tract near the GM transmission plant.

## **Automobile Workers Get Cent-An-Hour Increase**

Automobile workers have been granted a cent-an-hour increase as a result of higher living costs.

The raise brings to seven cents an hour the cost-of-living allowance paid under the famous "escalator" clause in most contracts between the union and automotive companies.

Largest single group affected by the increase are some 392,000 General Motors workers. More than 144,000 hourly workers at Ford also are covered by the UAW contracts.

In addition, more than 100,000 GM salaried employees will receive a \$35 allowance for the three-month period, while the bulk of 45,000 salaried per-

sonnel at Ford will get \$36.40. It is presumed that Chrysler employees will get a similar hike.

Under the old contracts with automobile companies, employees received a one-cent adjustment for each .6 rise or fall in the Bureau of Labor Statistics index. If the formula for figuring the adjustment had not been altered in the new contracts, the allowance would have remained at six cents.

The new contracts, however, changed the necessary margin to .5, and the 114.7 index became the lower limit of the seven-cent bracket. The 114.7 figure is the Government index for mid-July with price averages during the 1947-49 period equaling 100 on the scale.

## **National Automotive Fibres Will Double Space in N.J.**

National Automotive Fibres, Inc., will double manufacturing space at its Trenton, N. J., division for production of rubber and synthetic products. The company will spend approximately \$1.2 million for a new 75,000 sq ft plant and equipment there, and production is expected to get under way early next year.

## **Safety Factors, Greater Power Mark Ford Truck Line for 1956**

Featuring greater engine performance and payload capacity, the 1956 Ford truck line includes two new models—a T-750 tandem axle model in the heavy truck series, and a new pick-up with longer wheelbase. Gross vehicle weights extend from 5000 lb on the pick-up to 42,000 lb on the heavy-duty tandem axle models.

In addition to wrap-around windshields, styling advances include a new one-piece grille with integral headlamp hoods and housings. Introduced this year are two safety features—a safety steering wheel and safety door latches.

Tubeless tires come as standard equipment this year throughout the line. Seat belts are available as optional equipment.

Ford's short stroke engine design has been continued this year in eight more powerful engine combinations. These are said to offer an average of 17.3 per cent more power in the 1956 truck line than last year. Improved manifolding and valving have been used in the entire range of engines.

A special 168-hp Y-8 engine, equipped with four-barrel carburetor, is available in the medium-heavy truck series, while an optional power package for the heavy truck series consists of four-barrel carburetor, dual exhaust, and special cold air intake.

Power steering is available this year as optional equipment on conventional heavy trucks and is standard equipment on tandem models with 302 and 332 cu in. engines. The range of models on which Ford-O-Matic transmission is available has been extended to P-500 parcel delivery trucks. A standard 12-volt electrical system is used throughout the line.

## **Output of 1955 Buicks Tops Half Million Mark**

Buick on Aug. 29 built its 552,828th car for 1955 to mark the third time it has topped production of a half million units during a single model year. The new record broke the previous all-time high output of 552,827 units established during the 1950 model run.

# AND AVIATION INDUSTRIES

## Separate Plymouth Dealer Body To be Set Up by Chrysler Corp.

Chrysler last month confirmed recurring reports that it will split off Plymouth from the corporation's three other divisions to establish a separate dealer body. The long-discussed move is not expected to result in any immediate shakeup of the corporation's dealer organization. It will come gradually with the establishment of individual Plymouth dealerships in a few selected market areas at first.

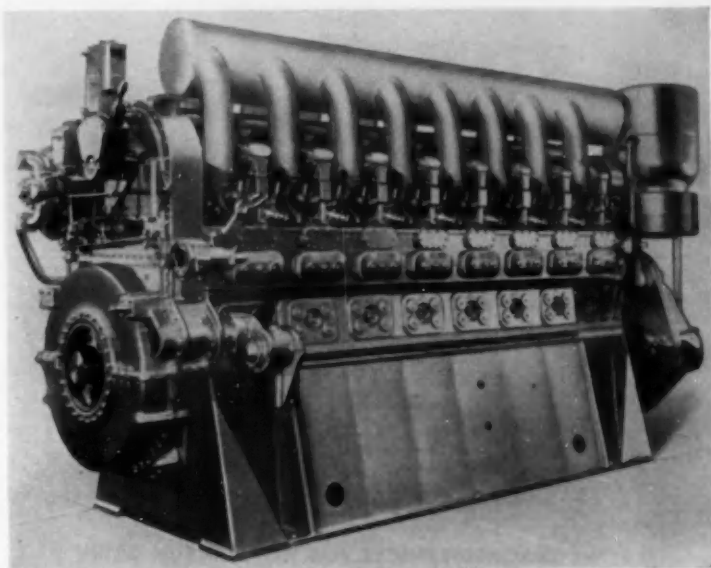
In some cases, existing dual dealerships may be retained, at least for the present, and any changes will depend on market conditions in particular areas. Who will be given first choice in exclusive Plymouth franchises is not known yet, but it is understood that the corporation will base much of its decision on the individual dealer's sales and service facilities.

The move is viewed by some observers as certain to bring protests from some Chrysler Corp. dealers, especially those who have been making their "bread and butter" from the Plymouth line for years, and there are still many problems to be worked out before the Plymouth can be totally divorced from other Chrysler lines.

Chrysler is said to feel that it has reached a point in its overall divisionalization program where such a step was logical. Backed by the tremendous sales comeback by all Chrysler divisions this year, the company reportedly believes the time has come for each division to be able to continue its performance without the partnership of another.

## Automobile Output Already Beyond 5.5 Million Figure

Since car production through the end of August was already over the 5.5 million mark, automobile factories need to produce only two million more units during the four remaining months of this year to achieve the anticipated record of 7.5 million units. Although output dropped somewhat during the model



## GM TURBOCHARGED DIESEL PROVIDES HIGHER OUTPUT

On display for the first time at the GM Powerama is the new Model 16-498 two-cycle, turbocharged Cleveland Diesel engine for marine and industrial markets. The V-type power plant has a bore of 8 3/4 in., stroke of 10 1/2 in., and is said to develop 175 bhp per cylinder. Available in six, eight, 12, and 16-cylinder sizes, the unit reportedly has a flat fuel rate curve from 50 to 100 per cent at any operating speed.

changeover period, the big push expected in the fourth quarter on 1956 models is certain to break the previous record of 6.6 million cars, set in 1950.

The industry needs to produce an average of only 500,000 units a month to hit the annual record. Since the beginning of the year, monthly output has averaged over 600,000 cars.

## Air Force Awards Contracts For New Jet-Powered Aircraft

Design-development contracts for new-type jet-powered combat aircraft have been awarded by the Air Force to Northrop Aircraft, Inc., North American Aviation, Inc., and Lockheed Aircraft Corp. They will develop designs for a new long-range interceptor.

Douglas Aircraft Co., Inc., will study a tactical bomber. North American Aviation will also work on developing a high-speed bomber.

## More Pastel Colors Will Be Visible On 1956 Cars

Automobile colors should become more subtle starting with 1956 models. Furthermore, the bright array of colors brought out on 1955 cars may be passé within the next few years, according to present indications. The trend will probably also be back to more subtle colors on automobile exteriors.

Although car makers are expected to offer some colors as intense and vivid as those on 1955 models, there will be a wider choice of pastel shades, which have remained popular through the years. George W. Walker, Ford director of styling, predicts that interior colors also will be toned down to match exterior hues.

Color, design, and durability of new fabrics developed for automobiles in the past few years have given stylists a new design instrument with which to work, Mr. Walker points out.



# News of the AUTOMOTIVE



## MARINE TRACKED VEHICLE FOR HIT-AND-RUN WORK

Firepower potential of Marine Corps units is to be strengthened by the new Ontos tracked vehicle. Allis-Chalmers Mfg. Co. will start production on a \$13 million contract for an unnamed number of the machines in August, 1956. The project involves about \$6 million worth of Government-supplied equipment. Mounting six 106 mm recoilless rifles, four .50 caliber spotting rifles, and a .30 caliber machine gun, the vehicle weighs 8.5 tons and is powered by a 145-hp GM engine, according to specifications.

## Kelsey-Hayes Plans Merger With Steel Products Co.

Stockholders will vote shortly on a proposed merger of Steel Products Engineering Co., Springfield, O., and Kelsey-Hayes Wheel Co., Detroit. Under the proposal, the Springfield plant would be managed by Kelsey-Hayes.

Steel Products makes prototype models, precision gears and transmissions, special machinery, and aircraft radar units. Kelsey-Hayes manufactures car wheels and related items.

## Retirement at 55, Fewer Hours Seen as Next Union Objectives

Now that its demand for the annual wage principle has been or is being resolved in most industries, the UAW-CIO is already laying the groundwork for its next campaign, which may make as many headlines as the GAW when present contracts in the automotive industries expire three years hence.

The next union objective reportedly

will be a shorter work week and retirement at the age of 55. The pressure already is on, but no one will venture to bet whether a new labor-management trend will be set again in 1958.

It is no secret, of course, that the UAW has long committed itself to a shorter work week, with the same amount of money, or possibly more, as the automobile worker makes now for 40 hours. Earlier retirement also has been discussed, but it is still far from realization at present.

Congress itself would have to act on any revisions in the Federal old age pension plans, so that workers could draw payments at age 55. Union pressure in that direction undoubtedly will be great in the next few years.

Much pressure is expected to come from unions representing workers in more hazardous type of jobs. Foundry workers, for example, already have raised a cry for earlier retirement, and the union has called for a joint labor-management study to lay a

foundation for revising present pension plans negotiated by automobile companies.

The shorter work week, already applied successfully to some industries, will be another major union objective, but it will probably face tough sledding when contract talks open again in three years with automobile manufacturers. Here, too, Congress would have to make any revisions, particularly if the unions demand that the overtime provision apply to a shorter work week.

## GM Installing Safety Unit For Doors on 1956 Models

A new door safety device is being installed on all General Motors cars. Designed to prevent automobile doors from being forced open during a collision, it consists of a flange on the door portion of the locking mechanism which overlaps another flange on the striker mounted on the body pillar.

The device is said to prevent the doors from opening under the most severe impacts. Other automobile manufacturers also have been experimenting with door interlocks for some time, and practically every car company is expected to offer the new safety doors on 1956 models, according to the latest reports.

## Nankervis Purchases Plant Formerly Operated by Nash

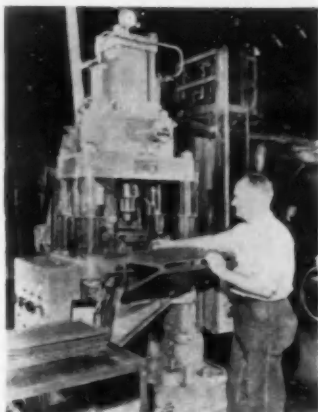
The George L. Nankervis Co. has announced the purchase of a 72,000 sq ft manufacturing plant formerly occupied by the Nash Motors Division of American Motors Corp. It is located on a five-acre plot at Fullerton and Whitcomb in Detroit.

Plans are being readied for a 12,000 sq ft addition to the plant for executive and general offices and an engineering drafting room. Extensive plant changes are also contemplated.

Floor area in the new plant will double the amount now available to the Nankervis Co. for its operations. The concern builds laboratory and production testing equipment for the automotive and aircraft industries, in addition to the engineering and installation of electro-plating systems.



# AND AVIATION INDUSTRIES



## B-L-H PRESS AIDS FORD

This new Model "L" 50-ton metal powder compacting press, built by Baldwin-Lima-Hamilton Corp., is playing an important part in the expanded production of automobiles at Ford Motor Co. Installed in the Steering Gear & Machining Plant, it is claimed by B-L-H to be producing twice as many oil pump gears as previously turned out by any other press.

## Technical Training Center To Be Built By Chrysler

Chrysler is planning to build a technical service training center adjacent to the MoPar plant northeast of Detroit. The building will have 75,000 sq ft of space and also will house the sales analysis group.

Chrysler has a 65-acre site where MoPar currently is located. There are some reports that the site may become the hub of the company's operations within the next five to 10 years.

## Four Aircraft Concerns Are Designing New Plane

Four aircraft manufacturers are designing a new high-performance, observation-reconnaissance plane for the Army and the Marine Corps. The concerns—Cessna, Fairchild, Hiller, and North American Aviation—are to report their designs to the Navy by Dec. 31.

The Navy, which let the four contracts, says they total \$250,000. Eventually, a successful design may resolve into a production contract.

# AI TABLOID

British Motor Corp. has announced a new seven-ton truck powered by a six-cylinder Diesel engine with power steering.

Bendix Aviation Corp. will construct a million-dollar facility in the Detroit area for its Research Laboratories Div. . . . Stratos Div. of Fairchild Engine and Airplane Corp. is establishing a facility at Babylon, N. Y., for the production of industrial products.

Penn-Texas Corp. has entered the powder metallurgy field with the formation of American Electro Metal Corp.

Westinghouse Electric Corp. has offered to purchase the assets of C. A. Olsen Mfg. Co., producer of residential furnaces. . . . Curtiss-Wright Corp. has offered to buy Massey Machine Co. through an exchange of stock.

Directors of ACF-Brill Motors Co. have approved a merger with its subsidiary, Wrigley's Stores, Inc., of Detroit. The former reportedly will continue, however, to produce buses and trucks under Government contract.

General Electric Co. recently dedicated a new \$5 million Metals and Ceramics Building at its Research Laboratory. . . . Marquardt Aircraft Co. is expanding its ceramic and cermet research and development program.

Goodyear Tire & Rubber Co. is now in production on a line of tubeless earthmover tires.

Timken Roller Bearing Co. has announced that it will build a new \$1.5 million warehouse next year at its Bucyrus, O., plant site.

Kloekner-Humboldt-Deutz A. G. of Germany has turned out more than 150,000 aircooled Diesel engines during the past five years.

Curtiss-Wright Corp. has received orders to build 500 turbo-compound engines designed for use in the overseas version of the Douglas DC-7. . . . United Air Lines plans the purchase of 25 jet transports at a minimum cost of \$125 million by the end of 1955.

Anaconda Aluminum Co. has formally opened its \$65 million primary aluminum metal producing plant at Columbia Falls, Mont.

Jones & Laughlin Steel Corp. will build a new plant at Williamantic, Conn., to produce cold-finished steel bars. . . . Gould-National Batteries, Inc., plans to build new automotive battery plant near Los Angeles, Calif.

Four-wheel hydraulic brakes are now standard equipment on the Michigan Model 75A Tractor Shovel. The machine is built by the Construction Machinery Div. of Clark Equipment Co.

Firestone Tire & Rubber Co. has launched production of a new type of synthetic rubber that it claims may replace natural rubber in truck tires.

Claud S. Gordon Co. of Chicago, Ill., has been named an exclusive distributor of Westinghouse standard industrial furnaces and related equipment.

Ford Motor Co. has raised prices of all 11 of its tractor models by 3.35 to 8.4 per cent.

(Turn to page 168, please)

# News of the AUTOMOTIVE

## TRUCKS PACE CARS IN STRENGTH OF SALES RECORDS

### 1955 U. S. Motor Vehicle Factory Sales\*

|                    | Passenger Cars | Trucks  | Buses | Totals    |           |
|--------------------|----------------|---------|-------|-----------|-----------|
|                    |                |         |       | 1955      | 1954      |
| January            | 635,513        | 89,670  | 190   | 725,373   | 551,134   |
| February           | 677,705        | 87,061  | 176   | 764,942   | 534,145   |
| March              | 791,280        | 102,962 | 325   | 894,567   | 633,023   |
| April              | 753,434        | 127,857 | 519   | 881,810   | 631,769   |
| May                | 721,139        | 127,941 | 313   | 849,393   | 568,562   |
| June               | 647,656        | 119,215 | 309   | 767,180   | 558,878   |
| July               | 658,736        | 109,589 | 296   | 768,621   | 530,415   |
| Total—Seven Months | 4,985,465      | 744,361 | 2,128 | 5,631,954 | 4,068,004 |

### 1955 U. S. Motor Truck Factory Sales by G.V.W.\*

|                   | 5,000 lb. and less | 5,001-10,000 | 10,001-14,000 | 14,001-16,000 | 16,001-18,000 | 18,001-20,000 | Over 20,000 | Total   |
|-------------------|--------------------|--------------|---------------|---------------|---------------|---------------|-------------|---------|
| January           | 42,398             | 16,066       | 4,809         | 16,489        | 4,741         | 3,279         | 3,687       | 89,670  |
| February          | 36,686             | 11,277       | 2,646         | 11,911        | 3,675         | 3,389         | 3,937       | 67,061  |
| March             | 49,916             | 19,275       | 4,166         | 19,179        | 4,363         | 3,457         | 4,720       | 102,962 |
| April             | 61,366             | 22,178       | 4,634         | 23,779        | 5,417         | 4,230         | 6,084       | 127,857 |
| May               | 60,287             | 21,721       | 5,149         | 24,420        | 6,408         | 3,734         | 6,222       | 127,941 |
| June              | 52,720             | 20,753       | 4,109         | 22,677        | 7,709         | 4,383         | 6,686       | 119,215 |
| July              | 49,363             | 19,813       | 3,711         | 22,194        | 6,783         | 4,221         | 5,984       | 109,589 |
| Total—7 Mos. 1955 | 343,563            | 128,672      | 29,658        | 140,016       | 39,260        | 25,922        | 37,642      | 744,361 |
| Total—7 Mos. 1954 | 296,914            | 116,965      | 24,371        | 122,526       | 27,147        | 21,379        | 24,119      | 642,411 |

\* Automobile Manufacturers Association.

## Chrysler, AMC Contracts Differ from Ford, GM

The recent agreement between Chrysler Corp. and the UAW-CIO on a new contract, to run until June 1, 1958, now brings the Big Three automobile manufacturers closely in line on most basic principles. The supplemental unemployment compensation plan is included.

However, Chrysler's contract differs significantly from the Ford and GM pacts in that about 8000 unionized office workers are also covered by the modified guaranteed wage. Another major difference in the Chrysler contract is that all Chrysler wage scales are equalized on a national scale.

Sept. 1 was made the effective date for payments under the annual improvement factor. Under the new contract, this provision has been increased from five to six cents an hour or 2½ per cent of the base pay, whichever is higher. Salaried employees will receive \$10.98 a month or three per cent of their base pay.

Chrysler's total package to the union, including fringe benefits, is estimated at 23 cents an hour for each worker. It will contribute five cents an hour into a trust fund for the annual wage plan for an eventual cost of more than \$52 million. Two separate trust funds have been set up

under the unemployment compensation plan—one for hourly workers and another for salaried employees.

### AMC Granted Slight Edge

Although American Motors Corp. finally agreed to the annual wage principle, payments into the trust fund have been postponed for one year. This marks the first time that any company bargaining on the so-called "guaranteed annual wage" plan has managed to gain a departure from the pattern set by the union with the Big Three.

Under the agreement, AMC will not start making payments into the fund until Sept. 15, 1956, and no payments will be made to employees until Sept. 15, 1957. The union accepted the company's position that its costs were higher than those of the Big Three, and the company compromised by accepting the union's GAW proposal.

The new contract, to run until June 15, 1958, provides a number of other benefits for some 24,000 AMC workers. All hourly employees will get a pay hike equal to six cents an hour or 2½ per cent of their base pay, whichever is greater, retroactive to June 1. A similar increase is provided for

June 1, 1956, and on June 1, 1957. Workers will also receive pay for a seventh holiday.

The company estimates that the total package of the new contract will cost 14 cents an hour for the first year, 20 cents the second year, and 26 cents the third.

### New Machinery Part Of Dana Expansion

Dana Corp. will replace half of the machinery at its Pottstown, Pa., plant with new equipment under a four-year expansion and modernization program now under way. Expenditures during the first year are expected to total more than \$1 million.

In addition to purchasing new equipment, the company plans to rebuild and repair some of the older equipment and modernize some plant buildings. The company plans to boost capacity at the Pottstown plant to the level of its new plant in Marion, O.

### Stockholders Approve Merger Of Hupp With Perfection

By a majority of more than 97 per cent, stockholders of Hupp Corp. and Perfection Industries, Inc., both Cleveland concerns voted to merge the two companies. Under the agreement, Perfection stockholders will receive preferred and common Hupp stock.

### Carboloy Grants Wage Hike Under New Pact With Union

Carboloy Dept. of General Electric Co. and the UAW local have reached an agreement on a new five-year contract covering 800 production workers. Although the contract does not embody the guaranteed annual wage factor, talks on the GAW issue are scheduled to reopen after three years, under the present agreement.

The new contract provides for a three per cent wage increase each year through 1957, an additional 3½ per cent boost in 1958 and about a similar increase in 1959. Several other improvements in benefits also are provided under the new pact.

# AND AVIATION INDUSTRIES

## Aircraft Show Illustrates Plane and Equipment Might

What was described as the greatest peacetime display of nearly every type of military aircraft and other aerial weapons ever assembled in the air and on the ground dazzled some 289,000 visitors to the 1955 National Aircraft Show. Held at International Airport, Philadelphia, Pa., over the Labor Day week-end, the gigantic exposition featured numerous flying exhibitions, static ground displays by all segments of the U. S. aircraft industry, and the annual Bendix, Allison, General Electric, and Thompson Trophy events.

### Armed Forces Activities

By and large the most active participant in the show was the Air Force. Included among the more than 150 aircraft demonstrated by this branch of the military services were the McDonnell F-101 Voodoo and the Lockheed C-130 Hercules.

Other Air Force activities included: acrobatic flying; release of a Republic F-84F from a B-36 bomber; aerial refueling of a B-47 bomber; simulated low-level strike by B-57 bombers; and an afterburner climb by F-86D Sabrejets.

Army Aviation staged a mock assault on the Philadelphia airport to demonstrate the role which helicopters and small planes play in its tactical operations. Piasecki H-19 helicopters were used to land assault troops, while Sikorsky rotary-wing aircraft were used as transport planes.

Demonstrations of mid-air refueling, aircraft carrier launching, acrobatic flying stunts, and fly-bys of its latest planes marked the Navy portion of the show program. The Marine Corps demonstrated its newest amphibious-aerial warfare techniques.

### Static Ground Displays

The Air Force alone showed 22 aircraft and models of three others in ground displays, while the other services did likewise in five huge hangars and their surrounding ramps. Considerable other exhibit space was occu-



*This new five-passenger Royal Gull amphibian airplane was displayed at the National Aircraft Show by Royal Aircraft Corp. (subsidiary of Kearney & Trecker Corp.) The twin-engine plane is powered by 270-hp Lycoming GO-480 B-1 engines equipped with three-bladed Hartzell Propellers. The craft has an overall empty weight of 6000 lb.*

pied by the displays of airframe, engine, and electronics manufacturers; as well as component builders and accessory suppliers.

Quite a few new items of military and commercial aviation equipment were to be found among the displays of some 75 exhibitors. Selected examples of these will be described and illustrated in an early issue of **AUTOMOTIVE INDUSTRIES**.

### Trophy Events and Winners

Since the running of the Bendix Trophy classic was delayed a day due to adverse flying conditions, the General Electric Trophy event came first on the contest agenda. The coast-to-coast speed dash from March AFB, Calif., to Philadelphia was won by a plane representing the 320th bombardment wing and commanded by Major Leonard J. Stevens. The winning Stratojet covered the 2337 miles in three hrs, 57 min, and 59.2 sec, for an average air speed of 589.294 mph.

Instead of an aerial contest, the Allison Trophy event this year was a quick-change engine competition among six Air Force ground crews. The winning team from Webb Air Force Base, Tex., completed changing engines in a Lockheed T-33 Shooting Star in 11 min and 32.2 sec.

Although there were six starters in the Bendix Trophy Race from George Air Force Base, Calif., to Philadel-

phia, only four finished the 2325-mile contest because the other two pilots blew tires at refueling stops. Flying an F-100C Super Sabre, winner Col. Carlos M. Talbott covered the distance in an elapsed time of three hrs, 48 min, and four sec, for an average air speed of 610.726 mph. He did not break the coast-to-coast record of 652.522 mph, nor the Bendix record of 616.208 mph.

Col. Horace A. Hanes, winner of the Thompson Trophy, did set a new world's record, however, last Aug. 20 when he flew an F-100C Super Sabre over an 18.11-kilometer (11.25-mile) open course at a speed of 822.135 mph. Officials explained that the trial was held prior to the show because of possible danger to the large crowd, required ideal weather conditions, and the need for \$8 million worth of timing and test equipment.

### Motor Wheel Sales, Earnings Increase

Higher sales and earnings for the first six months of this year have been reported by Motor Wheel Corp. Sales for the period totaled \$43.8 million, compared with \$29.6 million in the comparable 1954 period. Earnings climbed slightly to \$1.85 million.

Continued on Page 104

# Men in the News



*Accurate Bushing Co.—Vincent J. Powers has been elected president and general manager.*

Westinghouse Electric Corp.—Gwilym A. Price was elected chairman and president; Mark W. Cresap, Jr., executive vice-president and deputy chief executive officer; Latham E. Osborne, vice-chairman of the board; John K. Hodnette, vice-president and general manager of all product groups; A. C. Monteith, vice-president in charge of apparatus products divisions; and John A. Hutcheson, vice-president in charge of engineering and research.

Hudson Motors Div., American Motors Corp.—Walter S. Milton has been appointed sales manager.

Mercury Div., Ford Motor Co.—Joseph G. Lewis was appointed manager of dealer relations in the general sales office, and Paul R. Davis succeeds him as Eastern Regional sales manager.

Chrysler Div., Chrysler Corp.—Jack Tuttle is now West Coast fleet sales manager.

P & H Construction and Mining Div., Harnischfeger Corp.—J. F. Catalane has become general sales manager.

Brown-Lipe-Chapin Div., General Motors Corp.—Wayne A. Smith is now director of purchasing and production.

Minnesota Mining & Manufacturing Co., Irvington Div.—John W. Apgar has been promoted to manager of the new Special Products section.

Babcock & Wilcox Co.—Carl Claus has been named director of staff.

Bendix Aviation Corp.—Russell D. O'Neal was named director of weapons systems planning.

Plasecki Aircraft Corp.—Zbyslaw M. Ciolkosz has been appointed chief of design and analysis; Frank E. Mamrol, chief design engineer; and Herbert G. Somerson, chief analytical engineer.



*E. W. Bliss Co., Die Supply Div.—Carl J. Theken has been appointed manager, and Edmund J. Brumagin has been named sales manager.*

Greer Hydraulics, Inc., Products Div.—John T. Robinson was made sales manager.

McCauley Industrial Corp.—Walter B. Voisard has been named chief engineer, and Hugh V. Schierling has been made distributor sales manager.

Wales-Strippit Corp.—Walter L. Flanders has been appointed, works manager.

*Hydraulic Press Manufacturing Co.—John C. Cronley has been elected president.*



Black & Decker Mfg. Co., Wholesale and Industrial Automotive Divs.—Albert S. Fehesenfeld and Arthur L. Boehm, respectively, have been named to head these new divisions.

Parker Appliance Co., Tube and Hose Fittings, Rubber Products, and Industrial Hydraulics Divs.—D. A. Cameron has been appointed general sales manager.

Ford Motor Co., Tractor & Implement Div.—B. A. Best is now general finance manager.



*White Motor Co.—E. W. Schwartz has been appointed export manager.*

*Niles-Bement-Pond Co.—Joseph E. Lowes, Jr., was named director of public relations.*



New Process Gear Corp.—David H. Brown has been made assistant general manager in charge of operations.

Marshall-Eclipse Div., Bendix Aviation Corp.—Harry Stolar has been appointed assistant general manager.

LeTourneau - Westinghouse Co.—Jack McCann has been chosen Government sales manager, and Jack Errion has been named sales promotion manager.

Louis Allis Co.—E. P. Allis has been elected chairman of the board, and John W. Allis has been promoted to president.

Plymouth Div., Chrysler Corp.—C. Richard Johnston was named director of market analysis.

Calumet Steel and Franklin Steel Divs., Borg-Warner Corp.—W. B. Caldwell has retired as president, and Howard J. Davis has been elected to succeed him.

Ford Motor Co.—Thomas J. O'Neil was named executive director, sales and advertising staff, and F. J. Spittle was appointed manager of the Dealer Organization Dept.

GMC Truck & Coach Div., General Motors Corp.—Sheldon G. Little is now assistant chief engineer.

AC Spark Plug Div., General Motors Corp.—Joseph Holland has become sales manager of military products.

Ford Div., Ford Motor Co.—Harry L. Swan has been appointed assistant manager of the Advertising Dept.

Westinghouse Electric Corp., Electronic Tube Div.—Louis Martin has been named general sales manager.

Ray-O-Vac—Karl R. Bing has been promoted to special accounts manager.

Mack Motor Truck Corp., Bus Div.—Robert W. Tyson, Jr., has been appointed manager.



*Match & Merryweather Machinery Co.—Donald M. Patison was named director of marketing.*

Leeds & Northrup Co.—**Alexander H. Reynolds, Jr.**, has been elected treasurer.

U. S. Rubber Co.—**Carlton H. Gilbert** has been appointed director of advertising.

Ford Motor Co., Special Products Div.—**C. Gayle Warnock** has been named public relations manager.

Oldsmobile Div., General Motors Corp.—**Lee H. Witter** has been appointed director of salaried personnel.

Clark Equipment Co.—**Bert Walter** is now manager of industrial and community relations.

Leece-Neve Co.—**Frank O'Malley** has been named personnel director.

Carboloy Dept., General Electric Co.—**C. S. Wiedman** has been made manager of carbide products development engineering.

Warner Electric Brake & Clutch Co.—**Vernon D. Enwald** has been named Midwest regional manager.

Ford Motor Co., Automatic Transmission Div.—**John A. Swint** was made manager of plant operations in the Cincinnati area, and **Edward J. Hollenbeck** succeeds him as manager of the Livonia (Mich.) automatic transmission plant.

Northrop Aircraft, Inc.—**Francis H. Barnard** has been named controller.

Lear, Inc.—**Roy J. Benecchi** was elected vice-president and made manager of the Grand Rapids Div.

Signal-Stat Corp.—**Seymour Miller** has been appointed advertising manager.

Servomechanisms, Inc.—**Warren C. Wilson** is now advertising and public relations manager.

Olin Mathieson Chemical Corp., Metals Div.—**David T. Marvel** has been made vice-president in charge of sales.

Temco Aircraft Corp.—**Paul T. Smith** has been promoted to manager of accounting.

Vickers, Inc.—**J. M. Dutton** is now aircraft application engineer for the midwest sales region.

E. W. Bliss Co.—**B. E. Meyer** has been appointed general service manager.

New Britain Machine Co.—**Howard V. Williams** has been named manager of the Advertising Dept.

Climax Molybdenum Co.—**David C. McVey** was named a sales development manager.

Joseph T. Ryerson & Son, Inc., Tubular Products and Cold Finished Bar Div.—**Edward J. Richardson** is now manager.

Tube Reducing Corp.—**Alvin R. Almquist** has been elected secretary.

Pratt & Whitney Div., Niles-Bement-Pond Co.—**Joseph E. Burch, Jr.**, has been named West Coast gage sales engineer.

*P & H Industrial Div., Harnischfeger Corp.—Frank Blum is now general sales manager.*



Oxy-Catalyst, Inc.—**Gordon P. Larson** has been appointed vice-president.

Ace Drill Corp.—**Earl J. Peters** was made general sales manager.

Wales-Strippit Corp.—**Homer C. Gray, Jr.**, has been named vice-president and director of sales.

Minnesota Mining & Manufacturing Co.—**George D. Cockcroft** and **John W. Deyo** have been promoted to sales managers of coated abrasives and related products.

Ford Motor Co., Aircraft Engine Div.—**John B. Lawson** was named assistant general manager.

General Electric Co.—**Ross I. Parker** is retiring as commercial vice-president and will be succeeded by **George L. Irvine**.

Dodge Div., Chrysler Corp.—**Fred J. Cutlan** has been promoted to superintendent of body trim and assembly.



*Chrysler Corp.—Carl L. Horner has been appointed director of administrative services.*

*Le Roi Div., Westinghouse Air Brake Co.—H. J. Buttner has been made manager of engineering.*



Ford Motor Co., Tractor & Implement Div.—**James F. Pedder** has been promoted to Canadian sales manager.

Libbey-Owens-Ford Glass Co.—**James E. Starnner** has been promoted to assistant chief mechanical engineer.

Lindberg Engineering Co.—**Robert Duffy** is now district manager of the Milwaukee sales territory.

Ford Motor Co., Special Products Div.—**J. Beach Williamson** is now sales planning manager; **H. A. Pries**, dealer planning manager; and **Henry G. Baker**, market and sales analysis manager.

General Electric Co., Aircraft Gas Turbine Div.—**J. D. Wethe** has been made manager of marketing for the Evendale Operating Dept.

Gould-National Batteries, Inc.—**E. J. Bird** is now regional manager of automotive battery sales.

Taft-Peirce Mfg. Co.—**Roy R. Winn** is now district manager of the Detroit sales office.

*(Turn to page 178, please)*

## Necrology

**Herbert J. French**, 62, vice-president of International Nickel Co., Inc., died Aug. 17, at Rochester, Minn.

**Henry M. Yeager**, 72, former vice-president in charge of manufacturing for Fedders Manufacturing Co., died recently, at Buffalo, N. Y.

**Francis C. Willoughby**, 68, former president of Willoughby Body Works, died Aug. 13, at Utica, N. Y.

**Samuel C. Black**, 72, one-time executive vice-president of Willys-Overland Motors, Inc., died recently, at Huntington Park, Calif.

**James H. McCarthy**, 65, president of Hartford Industries, died Aug. 11, at Manhasset, N. Y.



# Within the Span of a Man's Hand

The power to transmit  
the commands  
of the operator  
to the machine . . . . .

By means of the movable PENDANT CONTROL the start and stop of the spindle; selection of speeds, feeds and directional movements of all heads in feed or traverse are quickly and easily accomplished. Interlocks and a stopall stick provide safety for both operator and machine.

## *Additional features include:*

### **SCREW FEED**

for vertical and horizontal motion of all heads — to assure fine smooth finishes with greater accuracy.

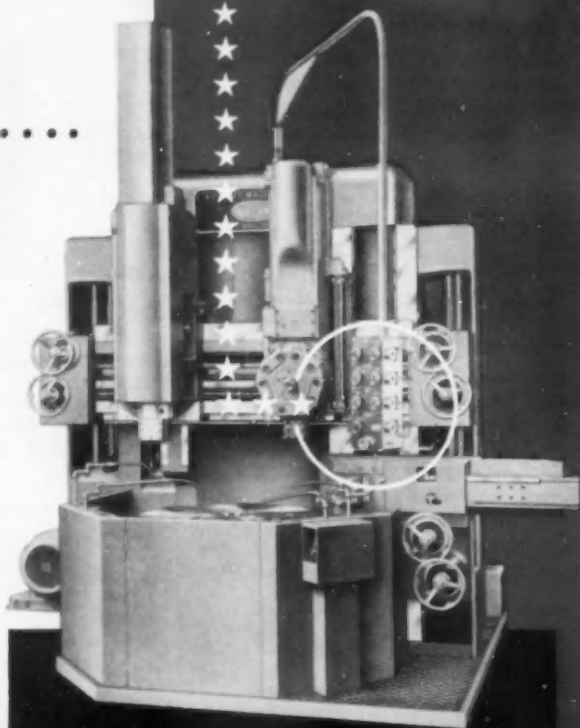
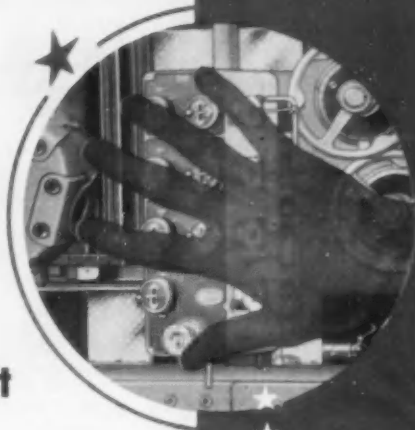
### **POWER INDEXED MAIN TURRET** (optional)

Five sided turret for "run of the mill" jobs. Four sided turret for production jobs.

PLAN TO VISIT OUR  
EXHIBIT AT BOOTH 1213  
AT THE N. M. T. S. A.  
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**CUTMASTER  
VERTICAL  
TURRET LATHE  
Model 75**

AVAILABLE IN 26,  
36, 46, 56, 66 AND  
76 INCH SIZES





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## **Highest, fastest, fastener field test**

When Bell Aircraft's X-1A dropped from the mother B-29 and raced to 1650 mph and, in another flight, rocketed to an altitude of 90,000 feet, it flashed past a whole line of aviation milestones. The X-1A met the challenge... and so did the Elastic Stop nuts applied to critical airframe and engine fastenings. ESNA fasteners, with their familiar red locking collars, have participated in every important air-

frame and engine development for more than twenty years. No test has ever been too severe, even when service conditions have been as unpredictable as they were during the epoch-making flights of the X-1A.

If you accept the practical value of more than two decades of satisfactory military and commercial field experience... you'll rely on Elastic Stop nuts.

### **ELASTIC STOP NUT CORPORATION OF AMERICA**

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**INSERTS are standard on all ESNA fixed fasteners guaranteeing:**

- extended reusability
- vibration-proof locking
- thread sealing... no galling
- immediate identification
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From the early days of the automotive industry, Auto-Lite has earned a reputation for building products of the highest quality and dependability for cars, trucks, tractors, planes and boats, as well as for our government and industry. That quality is reflected in the public acceptance of

the name Auto-Lite—the best-advertised name in the automotive aftermarket. It is reflected, too, in the established Auto-Lite service facilities throughout the world. Today's buyers know "You're Always Right . . . With Auto-Lite."

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This complex stamping is a side of the new "Band Box\*," Ackermann-Wheeling's nestable all-steel shipping container.

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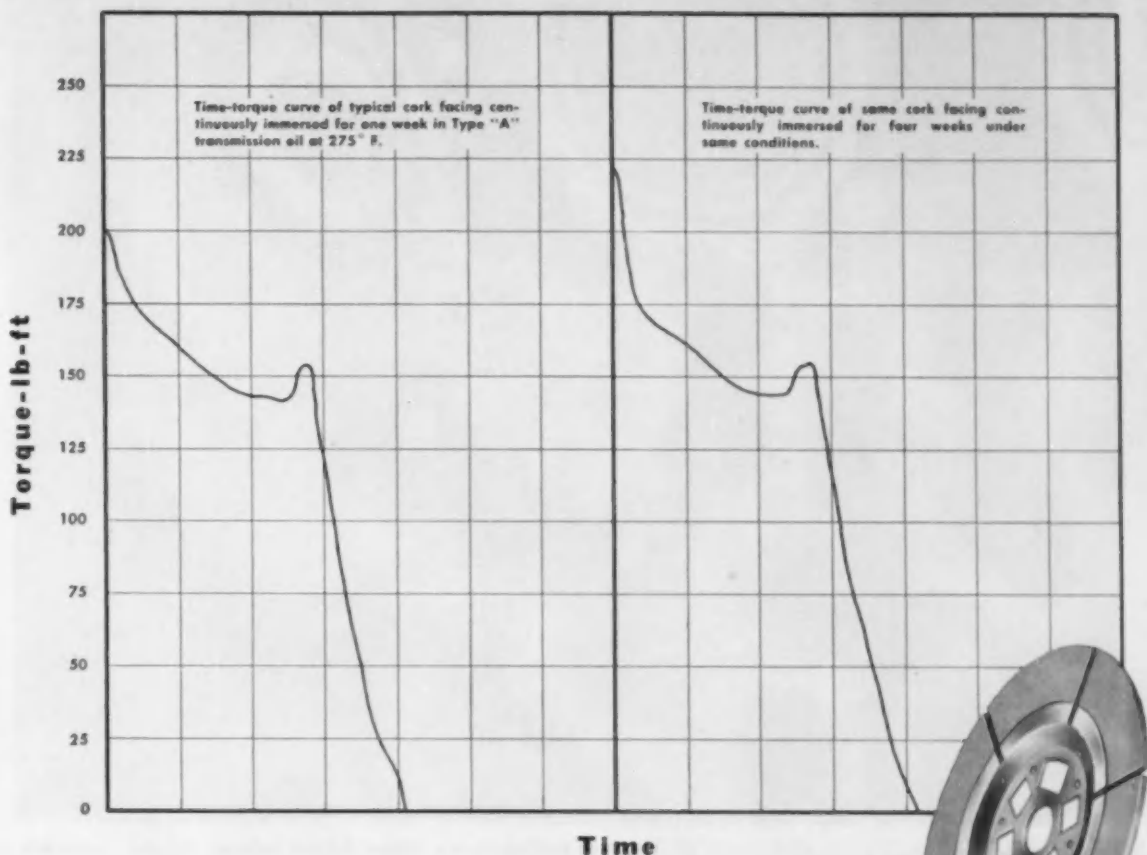


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"THE BAND BOX" is Ackermann-Wheeling's new fully nestable, self-palletized steel shipping container. Engineered to specific requirements. Send for full details.

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## CORK CLUTCH FACINGS:

High torque capacity at up to  
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Many wet clutches faced with Armstrong resilient friction materials are run regularly at ambient temperatures in the 250° — 300° F. range, almost double the commonly accepted textbook standard. In fact, flash temperatures during engagement actually go much higher without damage to the facing.

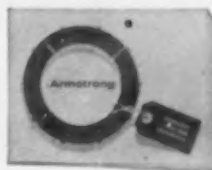
As the charts above indicate, a cork facing can maintain its torque capacity even after weeks of constant exposure to hot oil. In this test, the torque was actually slightly higher at the end than at the beginning.

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ture which today's transmission oils will withstand.

This unusual performance stems from careful compounding of cork friction materials, based on painstaking research on the varying demands of different transmissions. As a result, millions of automobiles now have Armstrong-made cork facings in their automatic transmissions, and experience has shown that these facings will run for the life of the car.

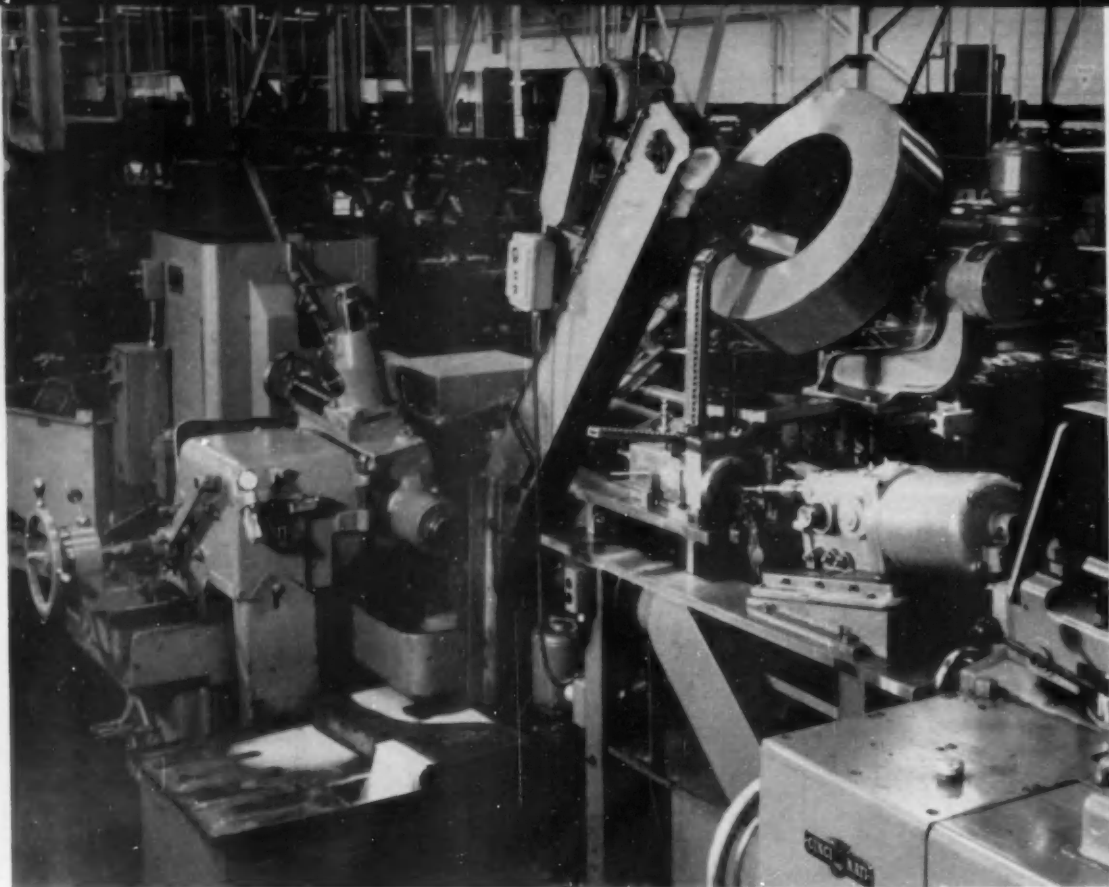
For more information on cork-compound friction materials, send for a copy of "Armstrong Resilient Friction Materials." Write to Armstrong Cork Co., Industrial Division, 7209 Imperial Avenue, Lancaster, Penna.



**Armstrong FRICTION MATERIALS**

... used wherever performance counts





*Portion of the automatic hauling arrangement on the Cincinnati Centerless grinder line for finishing plungers. Parts are fed automatically to the first grinder from the Feedall unit at the left. Emerging from this station they are elevated and loaded into the feed mechanism at the right from which they move along the magazine to feed into the special ball seat burnishing machine.*

## Automatic Handling of Parts in Hydraulic Valve Lifter Plant

**S**UCCESSIVE plant additions coupled with the acquisition of a large number of new machine tools have been required at the Diesel Equipment Division, General Motors Corp., Grand Rapids, Mich., to keep pace with the mounting demand for hydraulic valve lifters and other special products in recent years. As a matter of fact, this division accelerated production to a level of five million hydraulic valve lifters per month in the opening months of 1955.

Faced with a soaring product demand, the company is completing still another building addition that will add 140,000 sq ft of floor space. The consequent expansion of manufacturing facilities will make it possible to increase output at a more economical operating level.

Despite the increase in productive floor space and the additions of new items of automatic machine tools, the ability of this division to meet constantly increasing demands stems mainly from the skillful development of mechanization throughout the plant, resulting in an advanced form of automatic handling. Since the operation relies primarily upon individual automatic cycle machines, the general scheme has been the development of a system of conveyors and magazine feeds linking a group of machines—usually three or more—to effect automatic loading and unloading; and, in general, to eliminate all manual handling for a given series of operations.

In the making of hydraulic valve lifters this technique has been applied to such equipment as Ex-Cell-O





*This is how the flow of parts from screw machines has been organized to eliminate manual handling. Parts are ejected from each machine onto the belt conveyor then elevated to the hopper seen in the background. From the hopper the parts are distributed automatically to special drilling machines.*

## By Joseph Geschelin

four-spindle precision boring machines, Micromatic hones, special drilling machines, process lines including Cincinnati Centerless grinders, and electronic inspection devices. In addition, automatic handling has been organized in unique fashion for sorting and final assembly.

A selected group of machine lines is illustrated here to show some of the essential details. A typical installation usually consists of the following elements: a large hopper serving a Feedall magazine feed; an elevator to carry parts to a conveniently located track—usually over a row of machines; chutes leading from the track downward to loading station of each machine. A suitable electrical circuit—switches, relays, etc.—is imposed on the feed system to



*Line of special hardness testers designed by the company. Parts are fed from the right background, reaching each testing unit via the chute mechanism overhead. Hardness checking is automatic. Moreover, each tester automatically grades for hardness reading, accepted parts being ejected onto the Metzger belt conveyor in the center. They are picked up by the belt elevator at the left and loaded into the tote box.*

control the flow of parts to each individual machine according to demand. Thus, if the system is full at any time, the circuit will automatically shut off the Feed-all unit, or if one machine of a battery requires material only that machine will be fed.

Similarly, the unloading side of the system at the rear of a group of machines receives parts on a power driven belt, transporting finished or semi-finished parts as the case may be to a hopper, then through a washer.

Naturally there are many variations of this scheme depending upon the nature of the equipment and operations. This will be evident upon examination of the illustrations.

Before proceeding to a more detailed examination of certain automatic arrangements, it is of interest to note that the company is rapidly changing over to valve lifters with steel bodies. Incident to this change in basic design, the cylinder bore is being finished exclusively on small, special Bryant internal grinders fitted with automatic loading and unloading. Internal grinding of steel barrels is said to give excellent dimensional control, near perfection with respect to roundness and straightness, and with excellent surface finish.

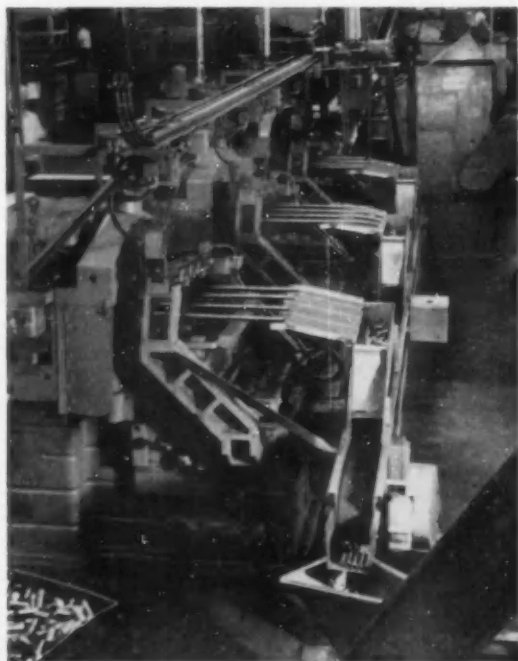
Let us take a look now at some specific operations. One good example is the mechanization of a line of National Acme Gridley automatic screw machines. As the parts leave a screw machine they are transported by a chute to a loader, then elevated to a hopper. From the hopper the parts are distributed to a group of multiple-head drilling machines. The parts go through the drilling cycle automatically and are ejected onto a chute which is suitably spiralled to turn the work in proper relation for the washing operation. For example, in the case of the barrel, work is so turned as to present the open end.

One of the most distinctive arrangements is found in the case of the Micromatic honing machines. These are of two-spindle type, with trunnion fixtures that automatically eject the work to the rear. Here, as described earlier, there is a hopper, a Feedall magazine, an elevator reaching a track mounted over three machines, and magazines leading from the track to each of the two spindles of each honing machine. As the parts leave the Feedall unit, they are engaged by an automatically cycled plunger to make sure that each barrel is moving with the open end up.

As the barrels leave the hones, they are ejected onto a power driven belt conveyor and move directly to the inspection station for grading.

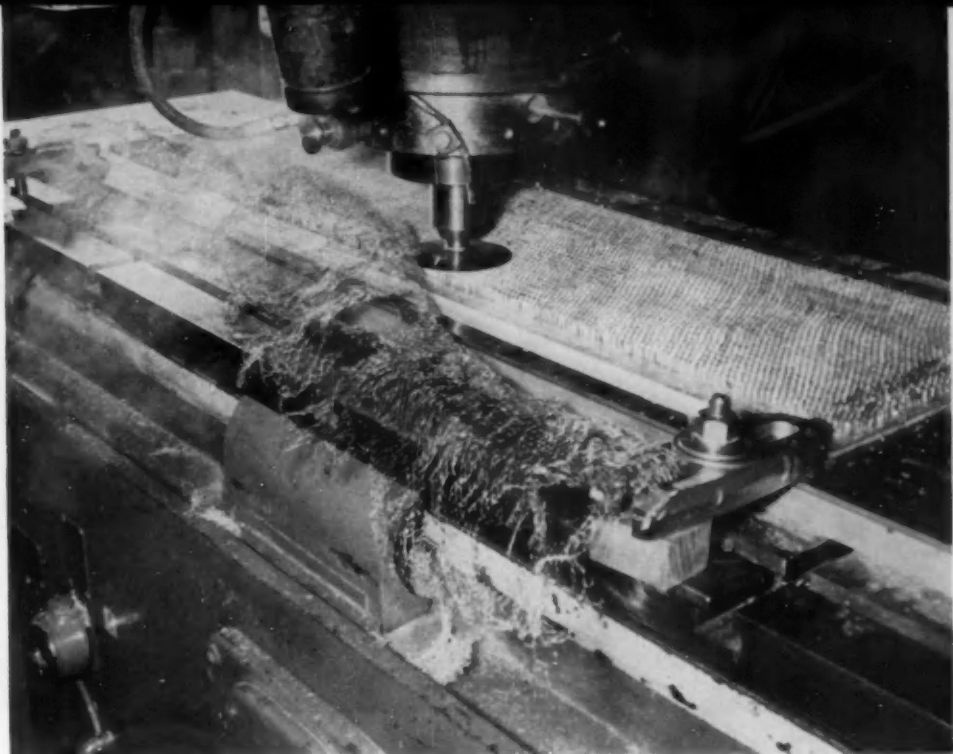


*Perspective of one of the many individual assembly conveyor lines for hydraulic valve lifter assemblies.*



*Here is a typical arrangement of automatic handling tying together (in this instance) three Ex-Celli-O four-spindle precision-boring machines. Parts are fed to the machine along the chute over them. Finished parts emerge on the chutes in the center and are delivered by belt to the elevator in the foreground at the right.*

Another noteworthy mechanized line is the Cincinnati Centerless grinding setup on plungers. The screw  
(Turn to page 110, please)



Setup for machining aluminum honeycomb

## Machining Aluminum Honeycomb without

### Aid of Filler Materials

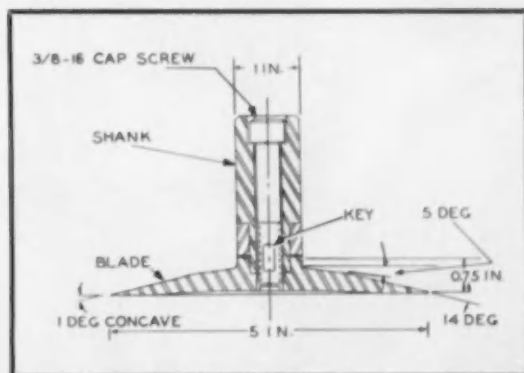
**M**ACHINING of unsupported aluminum honeycomb has opened a new field for the use of honeycomb core fillers in the manufacture of aircraft components at Convair-Fort Worth. New cutting tools, holding fixtures, methods and techniques for machining aluminum honeycomb have been developed and are currently being used in production work. At present only straight line cuts are being used; however, other types of cuts are in the process of development—some nearing completion.

A minimum machining speed of 1750 sfpm with a maximum table feed of 0.017 in. per surface ft (approximately 30 ipm) is obtainable using standard milling equipment. Machined surface finishes suitable for bonding and tolerances less than plus or minus 0.030 in. are held consistently at the above speed and feed.

Materials, tool and equipment used for preparing

By G. R. Gordon  
Asst. Chief Tool Engineer

Manufacturing Research, Convair Div.  
General Dynamics Corp.



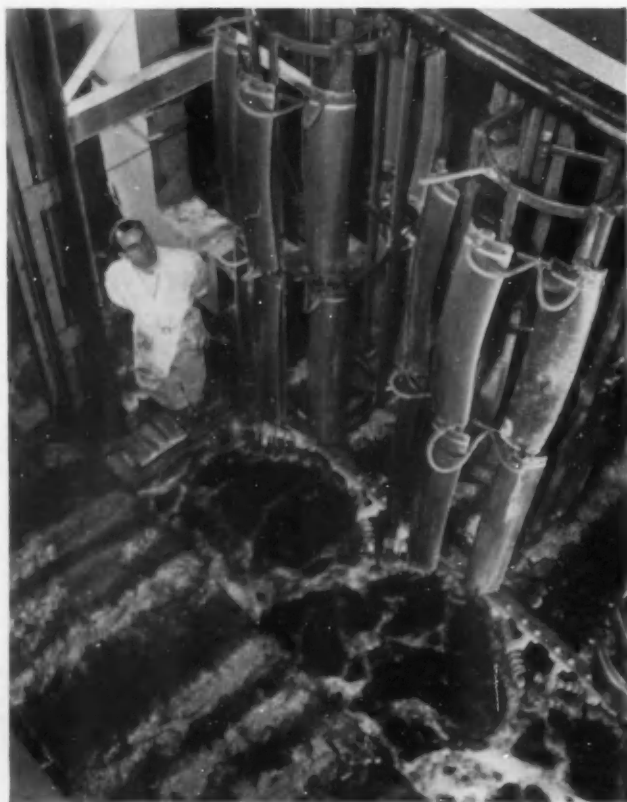
Sectional view of one of the cutters used for machining thin-walled cellular structures

and machining aluminum honeycomb core consist of: paint brush and a sodium silicate adhesive; an adhesive based tape; layup tables; holding plates of 0.062 in. stainless steel sheet stock; shot bags; a

(Turn to page 138, please)



Thousands of electrical components are used in the intricate control system which automates the Mecker plating machines. Pictured here are panels of the Electro-Graphic Detector System, built by W. F. & John Barnes.



A rack of bumper center plates emerging from tank of solution.

## World's Largest

By Thomas Mac New

**E**ACH working day the new Chevrolet spring and bumper plant in Livonia plates 60,000 bumper sections for passenger cars and trucks. This plating facility, no doubt the largest in the world, comprises over a third of a mile of plating machines requiring 906,000 gallons of solution. The system was engineered and installed by the George L. Nankervis Co.

An area of 180,000 sq ft, on two floors, was required for the installation. A break with tradition was made when the plating machines and generators were put on the second floor and the accessory equipment directly below on the first. This enabled the entire system to be open and accessible without pits or trenches. Another innovation was the installation of the plating tanks through the second floor. Each tank extends but 30 in. above the second floor level, with the balance projecting below.

The system consists basically of three,

straight line, fully automatic plating machines built by The Meaker Co. Each is 17 ft wide; 25 ft high and 535 ft long. Installed side by side, they process the bumpers through a complete copper, nickel and chromium sequence. Parallel installation permits independent operation of any of the machines for a complete plating cycle. A complete cycle consists of 41 pre-cleaning, plating, reclaim and rinse operations.

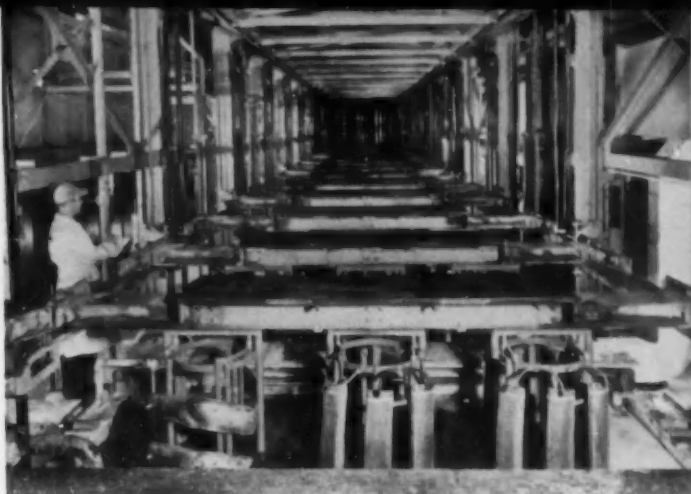
The machines are selective, batch type units, which are unique in operation. Instead of the bumpers moving through the machine progressively as they do in conventional straight-line machines, they actually pass each other by the skip-transfer method. This is the essence of batch type operation and is required because of the shape of the Chevrolet wrap-around bumper. To enable an even plate to be deposited on the curved surfaces, it was necessary to surround the bumpers with

## Plating Facility is Fully Automatic

equally spaced or conforming anodes. This precluded any horizontal travel in the tanks. All horizontal travel had to be above the tanks, and as the time intervals in the various processes differed so widely (rinse 57 seconds, copper plate 25 minutes), it was necessary for the bumpers to pass each other in certain sections of the machine.

The Chevrolet bumper consists of three sections; a center bar and two end wings. The plating racks were designed to accommodate either 12 end wings or 12 center bars. Three racks comprise a load for simultaneous processing. These are supported and conveyed through the machine on free wheeling, I-shaped carriers, which traverse the width of the machine, and ride on rails extending its entire length. These rails are fixed where forward travel only is desired, such as between stations, and are movable where the work is lowered into the tanks. Each carrier, with its load of bumpers, weighs approximately 2400 pounds.

*(Continued on next page)*

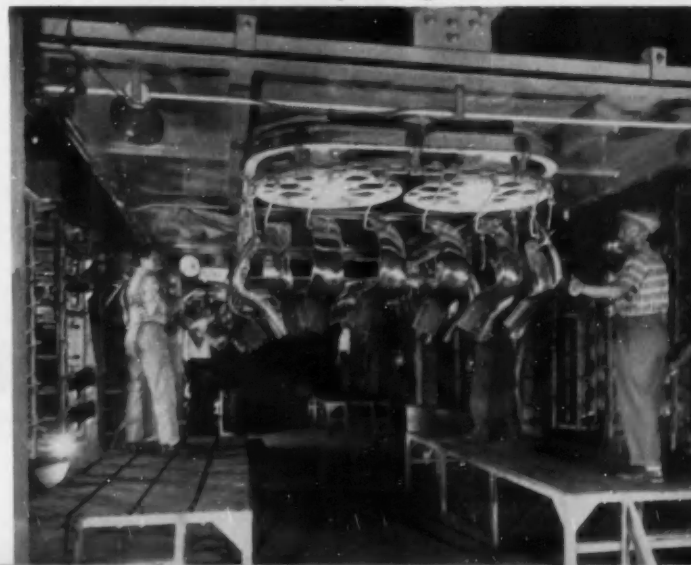


Bumpers are racked and conveyed through the Meaker plating machine on carriers like these—a moving load of 2400 lb. Pictured here are the 15 pre-cleaning tanks prior to copper plating.



Here, on the second level of the plating machine, empty carriers are returned to the starting end by a rapid transit, self-demanding shuttle system.

On the first floor, plated bumper ends being unloaded from plating racks to conveyor leading to buffing room.





## World's Largest Plating Facility . . . . . continued . . .

The bumpers enter the machine on the first floor and are loaded onto plating racks. When loaded, the carrier is lifted to the second floor plating area on a screw type elevator which is an integral part of the machine. Lifting units of the elevator are two double-threaded screws, four in. in diameter and 28 ft long. On each is a large, free running nut which travels up and down as the screws are rotated. Each nut is supported in a structural member which actually holds the carrier. The load is counter-balanced to assure smooth operation with a minimum of friction. The elevator is operated automatically and is regulated by limit and plugging switches which stop it in a fraction of an inch. All vertical movements of the bumpers, in and out of the tanks, loading and unloading, are accomplished on screw type elevators of similar construction.

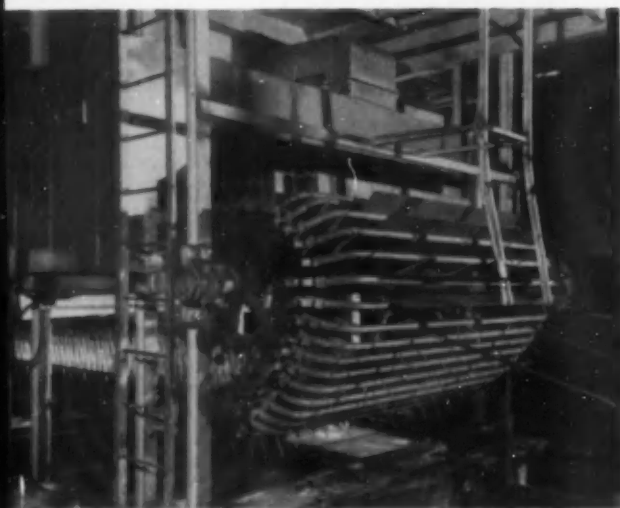
When the carrier reaches the top of the elevator, it is in alignment with the machine rails. It is then rolled off the elevator and onto the rails by means of an overhead shuttle system.

A shuttle, with a series of equally spaced pusher dogs, advances the carrier directly over tank No. 1 where it latches into place. Then the rails lower, immersing the bumpers. The bumpers remain in the first tank 57 seconds. During this time another load of bumpers is racked and lifted, ready to enter the machine on the next cycle. At the end of the 57 second interval, the bumpers are lifted out of tank No. 1 and engaged with the shuttle again. This time the shuttle advances the carrier to tank No. 2 and simultaneously pulls a new load off the elevator and over tank No. 1. The rails lower again, immersing both racks. Raising,

lowering and advancing the bumpers for each process takes 50 seconds. This period, plus the 57 second dwell time, gives an operating cycle of 107 seconds. After the bumpers have gone through a series of 15 pre-cleaning processes in this manner, they enter the copper section of the machine.

In the copper section, the carriers are advanced by a walking beam shuttle. As a load of bumpers leaves the pre-cleaning section, it is advanced to a position directly above the first copper plating tank. Again a section of the rail, the width of the carrier, lowers—immersing the bumpers. An auxiliary rail immediately comes into position to replace the movable section, allowing subsequent carriers to roll past the filled tank. Each load of bumpers remains in the copper solution 25 minutes. Therefore, when the next carrier enters the copper section, 107 seconds later, it passes over the first copper tank and enters the second. This continues in sequence until all 15 copper cells are filled. By the time the last one is filled, the first batch of bumpers is ready to be removed and advanced to the following reclaim and rinse tanks. Thereafter, it is lifted out and advanced by the shuttle over 14 copper cells and into the first reclaim rinse tank.

While in the acid copper tanks, the bumpers are surrounded by copper anodes which are positioned to conform with the shape of the bumpers. This "nesting" assures an even 0.0011 in. deposition on both the flat and the curved surfaces. Over 200,000 gallons of acid-copper solution is used. It is continuously filtered at the rate of 225,000 gph. As it is recirculated to the tanks, it passes through a bank of heat exchangers which hold the temperature at 95 F. High-speed, cen-



Conveyor which carries blanks through the washing machine.



Bumpers emerging from hot water rinse in the plating plant.

trifugal compressors force air into each tank to keep the solution in agitation. All the components in the circuit, pumps, filters, tanks, pipes, valves, regulators and heat exchangers are either constructed of, or are lined with, acid resistant materials.

Immediately following copper plating, the bumpers are processed through a reclaim tank. Here the copper solution is washed off, preventing it from contaminating successive baths and trapping it for reclamation. Each week the contents of the reclaim tank are drained to a "dummy" or copper plateout tank where the copper is plated out of solution onto anodes. Scrap recovery of almost 500 lb of pure electrolytic copper a week is realized.

Next the bumpers enter the nickel section. Here they remain in solution for 20 minutes to receive a 0.00075 in. deposit. In one of 12 tanks, holding a total of 166,200 gallons, each rack is immersed for 20 minutes. Here too, the solutions are continuously filtered and circulated through pure nickel heat exchangers to maintain an even temperature of 135 F. Filtration of the copper and nickel solutions is done at the rate of approximately 420,000 gph. As the bumpers leave the nickel section they are immersed into a reclaim tank and several water rinses.

With the completion of the nickel operations, the bumpers are again lowered on elevators to the first floor for buffing. Returning they enter the chrome section of the machine. Here, in one of three tanks, each holding 17,600 gallons of chromic acid, the final plate is deposited. A relatively quick process, it takes only four minutes to produce the chrome finish. Each tank is lined with vinyl plastic to withstand the particularly oxidizing effect of the acid, and to protect the plastic from mechanical damage, each tank is brick lined. A high-velocity exhaust system is used to remove the irritating acid fumes. Before exhaust-

ing the fumes they are thoroughly washed to remove all the chromic acid, thus preventing any staining "fall-out."

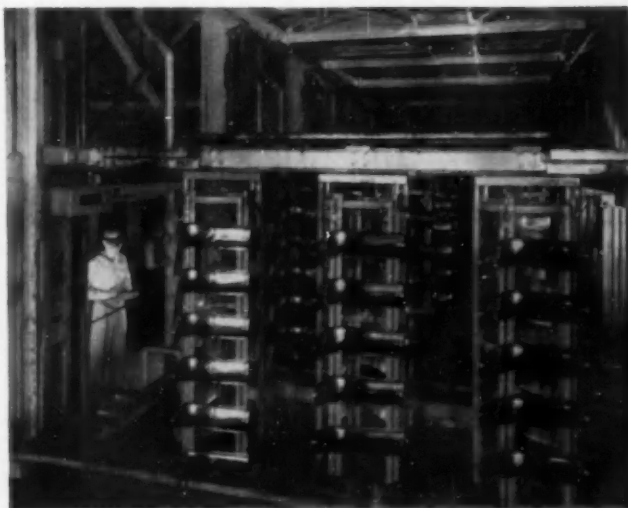
Following chrome plating, the bumpers enter a reclaim tank and several water rinses. They are then removed from the racks and loaded onto conveyors for delivery to the Shipping Department. Recovery of the chromic acid from the reclaim tank is accomplished through a distillation system. This not only contributes to economical operation as the acid is re-used, but prevents it from being dumped into the sewer system for eventual pollution of public waters.

All the sequencing, selecting and indexing of the entire machine are completely automatic, being done with stepping relays, limit switches, counters, timers and similar components.

It is possible to operate the machine in any one of three ways: automatic, manual or storage. With the selector switch on Automatic, the machine performs all operations automatically, on a 107 second cycle. Every 107 seconds a carrier of unplated bumpers is taken into the machine and simultaneously another is discharged with plated ones. All intervening operations are done either in 107 second intervals or in multiples thereof. Should any operation get out of sequence or time, the machine automatically stops. When the finished bumpers are removed, the empty racks are lifted on chain elevators, in cycle, to the upper portion of the machine for rapid transit, by means of shuttles, back to the loading end of the machine.

Operation on Manual is used to set up the machine for automatic operation and to operate it experimentally. On Manual it is possible to start a load of bumpers in one end of the machine, and to advance it through the entire machine, step by step, by oper-

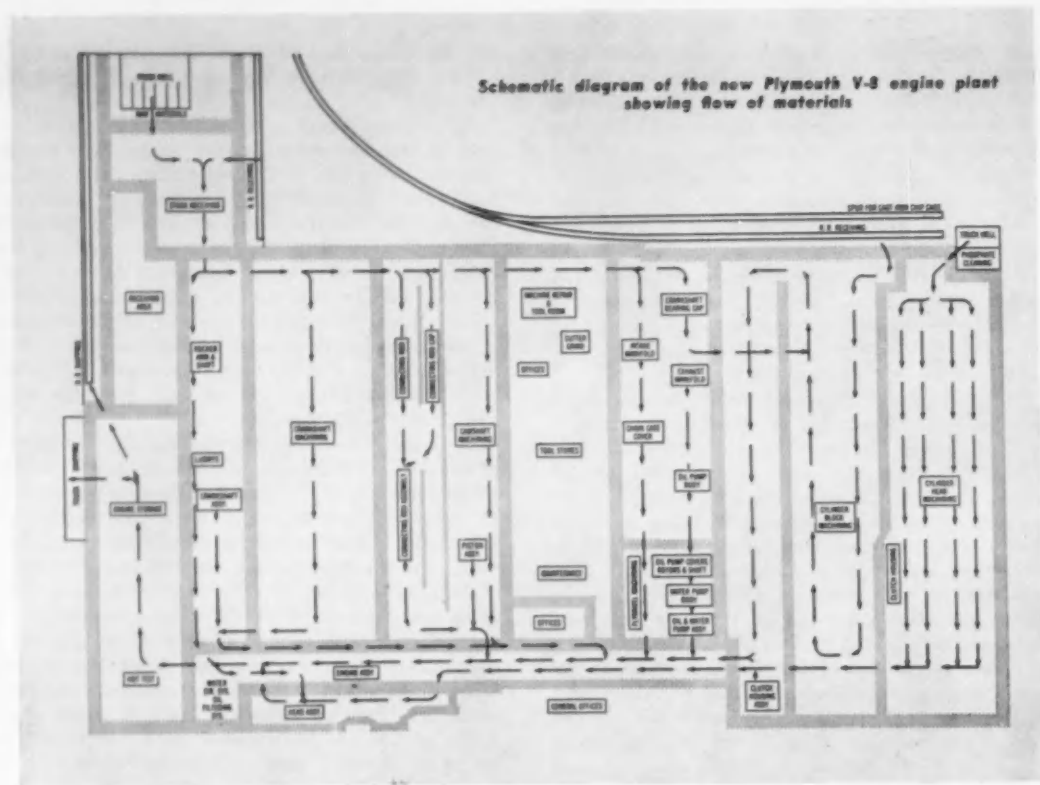
*(Turn to page 118, please)*



Loaded racks carrying bumper ends are lifted from tanks below; moved automatically to the next tank and lowered.



Closeup of one of the polishing heads on the automatic polishing machine.



One of the innovations is the automatic engine test. Following the electrostatic painting process, the engines are moved by conveyor to test stands where they are fed oil, water, and natural gas automatically and run for 20 minute test cycles.

## Newest Automatic Equipment

**A**DDITIONS to the former Chrysler Mound Road plant have brought Plymouth's V-8 engine plant facilities to a total manufacturing floor area of 534,000 sq ft. See AI, September 1, page 68. A 60 by 520-ft bay running the length of the plant's south end, plus a large addition to the northeast corner, amount to 71,000 sq ft of new space. The building was obtained in the Chrysler purchase of the Briggs automobile manufacturing facilities in 1953.

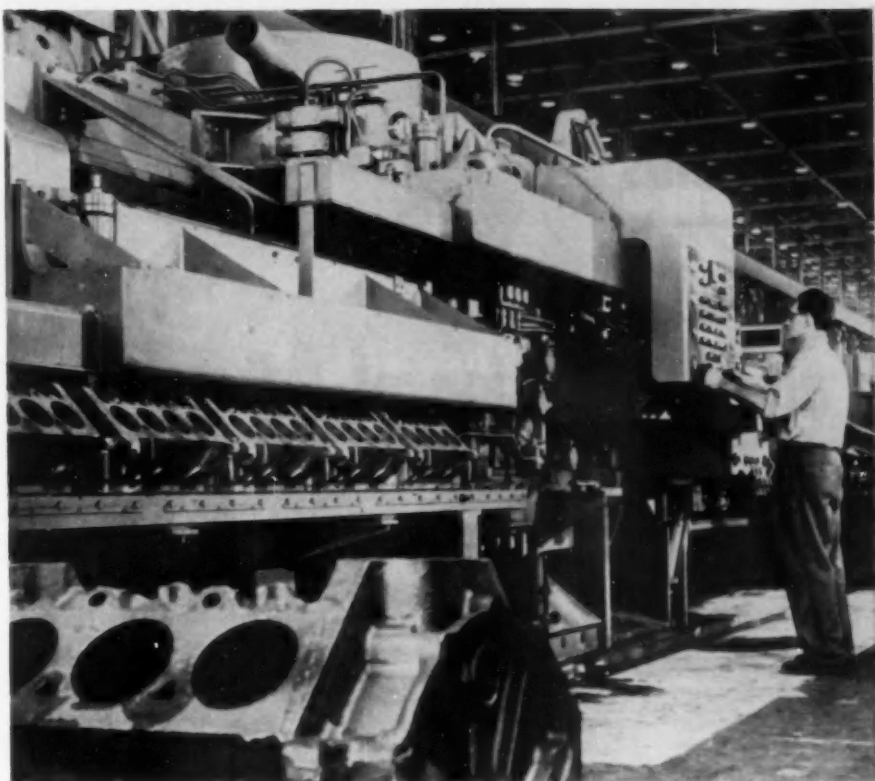
The new plant, situated in northeast Detroit, will have an eventual capacity of 3000 engines a day. Currently, it is producing about 600 engines a day in accordance with a planned schedule.

Aisles are kept clear of materials through the use of more than four miles of overhead conveyors which cover 200,000 sq ft of the plant.

Much of the 20,500 miles of electrical wiring in the plant is concentrated in Detecto panels that probe the source of trouble on a production line.

Dust and chips are taken through the bottom of the machines into drag-type underfloor conveyors that carry them to a larger conveyor at the head of each





Plymouth's new plant includes this mammoth Cincinnati broach. It is 59 ft long, 19 ft wide, and 12 ft high. Located at the beginning of the cylinder block line, the machine, along with a slightly smaller model, completely broaches the engine block in eight operations.

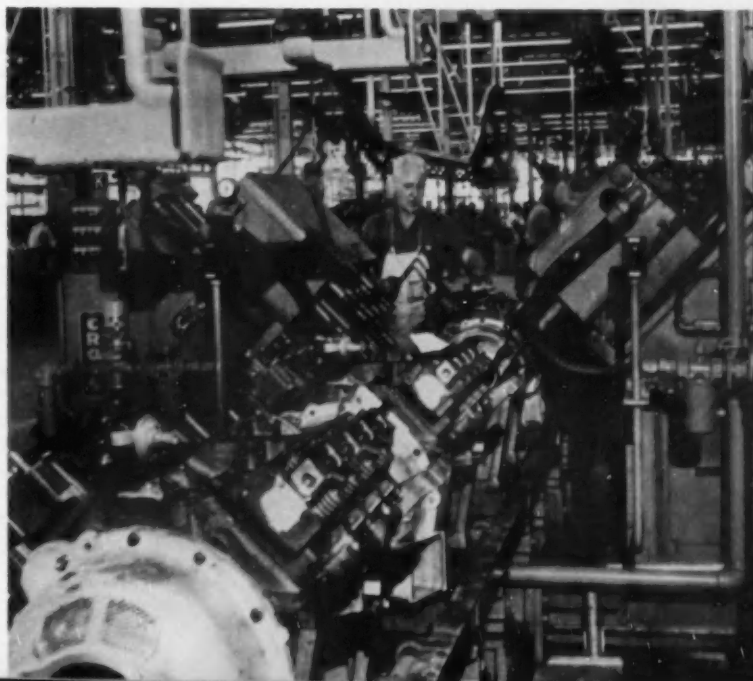
## In Plymouth Engine Plant

Among other new equipment on the automatic assembly line is the horizontal nut running machine. The entire operation is 560 ft in length, has one block line and two head lines and contains 72 separate assembly operations. When in full production, engines will roll off the line at the rate of  $2\frac{1}{2}$  every minute.

line. These transport the load to 120-ton storage hoppers before dumping them into railroad gondola cars.

Steel chips move through velocity trenches under the machines at a rate of two tons an hour. Some 36,000 gallons of water soluble coolant is pumped through these trenches at the rate of 10 ft a second. These chips are washed into a 40,000-gallon tank where they are permitted to settle for seven minutes before continuing to the dumping area. Numerous machines have individual filtering systems.

Sixty-one dust collectors in the cast iron or dry machining areas are part of a "down-draft" system which forces dust and chips downward into the trench network under the floors. Each collector filters 10,000 cu ft of air each minute.



# Soviet Systems

for

## Design and Production of Aircraft

**T**HE designing of new aircraft in Russia is in a variety of ways closely interrelated with their production. This tie-in is clearly reflected in the organization of designing work itself. This article is devoted to a brief history and a description of the way designing has been organized in the Soviet aircraft industry.

Until the second Five Year Plan, the designing of aircraft, aircraft engines and propellers was in the main concentrated in TsAGI (the Central Aero-Hydrodynamic Institute *imeni Zhukovskii* in Moscow). Several experimental airplane designs had been created in the Military Aviation Academy *imeni Zhukovskii* in Moscow, the Moscow Aviation Institute (MAI), the Kharkov Aviation Institute (KhAI), the Voronezh Aviation Technicum (VAT), and in several others. At that time, aircraft plants did not have a sufficient number of skilled cadres and lacked the equipment for such complex work. Only two aircraft plants had the resources for designing new machines. These were the No. 24 Engine Plant *imeni Frunze* and the No. 1 Airplane Plant *imeni Aviakhim*, both in Moscow.

At the end of 1930 the Engine and Propeller Division of TsAGI was converted into the independent Central Institute for Aviation Engines *imeni Baranov* (TsIAM), where was concentrated nearly all research, scientific, designing, experimental and testing work, both current and long-range, in this field.

Thereafter, for several years, the creation of new airplanes (primarily military) was concentrated in TsAGI, while the creation of new aircraft engines was centered in TsIAM.

In the first years of the Second Five Year Plan, there was a noticeable tendency toward the centraliza-

**T**HIS article presents a section from the comprehensive report, "The Soviet Aircraft Industry," which has just been released at the University of North Carolina. The report, compiled there by a team of research experts at the Institute for Research in Social Science, is based on a thorough search through Soviet source material dealing with the aircraft industry of that country. Although only a very limited amount of data is available due to the extreme secrecy precautions in effect, it yielded valuable information on the over-all engineering and production organization.

Of three previous reports released by the Institute, an article based on one of them was published by AUTOMOTIVE INDUSTRIES in two parts—"Soviet Industrial Planning for Mobilization" in the Aug. 15, 1954 issue and "Automotive Industry Is Key to Russian Mobilization Plans" in the Sept. 15, 1954 issue. The other two reports were on Soviet city-regional planning and the Soviet railroad equipment industry.

tion of designing and building of experimental models in these two powerful institutes, in spite of strong protests on the part of plants which wanted to retain these functions themselves.

In the course of time, due to the growth of aircraft plants, the acquisition of young specialists from the higher technical schools, and the accumulation of experience among the older plant cadres, the plants

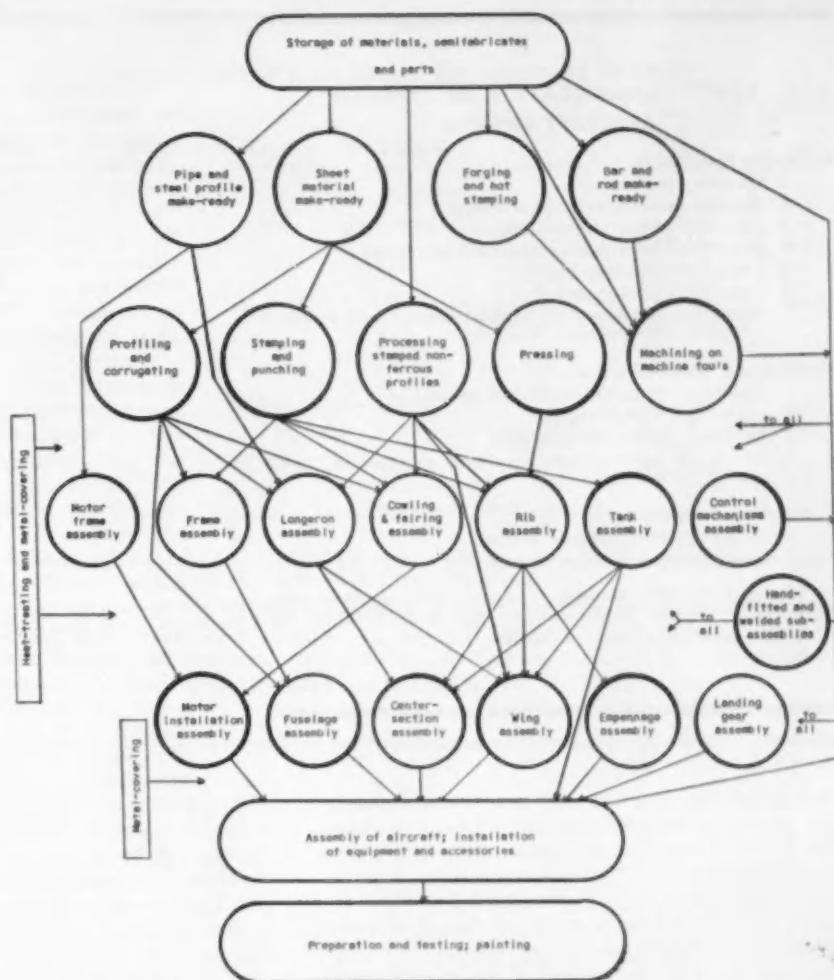


became able to undertake designing work on their own. This was called for by the need to put new models into production rapidly, to speed up the revision of experimental models, and the modernization of models already in series production. By the second half of the Second Five Year Plan many aircraft plants had their own designing departments or bureaus, and had reinstituted or created new experimental shops in which experimental models were transformed into standard models for series production. The central party leadership of the aviation industry showed a noticeable tendency toward the decentralization of the latter stages of designing, transferring these functions directly to the plants. In this trend, the designing cadres in plants were strengthened by the transfer of experienced designers from TsAGI and TsIAM.

The results of these measures quickly became evident; the time required for introducing new models and modernizing old ones was sharply reduced, and the quality of standard production models was improved.

Subsequently, the designing of new airplanes (airframes and engines) was carried out in the central scientific-research institutes (TsAGI and TsIAM, in the academic institutes (VVA, MAI, KhAI, etc.), and in the large plants having adequate personnel and equipment. Plants which did not have such capabilities carried out only the latter stages of designing of new machines projected elsewhere, or the modernization and revision of models already in series production. It may be assumed that this arrangement has survived to the present time.

Mechanism engineers project the main mechanisms of the airplane. The so-called "technical" design is compiled, accompanied by more accurate arrangement



**TECHNOLOGICAL PROCESS IN THE MANUFACTURE OF METAL AIRCRAFT**

decisions, general produceability decisions for the major mechanisms, detailed power, operational and strength calculations, and necessary laboratory research and testing work. The technical design requires the same approvals as the sketch design.

Parts-designers work out individual parts, such as pistons, piston pins, connecting rods, valves, rocker arms, gears, etc. Mechanism-designers bring together the detail designs, while the main designer combines the completed mechanisms or sub-assemblies into the complete machine. General power and tactical-operational calculations are usually carried out by the main designer and his assistants. For complex calculations, a special group is set up, with specialists and their equipment. Normal calculations of strength are done by the designers themselves in the process of designing each part. Complex or new calculations are carried out by the staffs of special laboratories in conjunction with designers. In the process of designing,

## SOVIET CLASSIFICATION OF TYPES OF AIRCRAFT ENGINES

### A Primary Power Plants

- 1 Gasoline piston engines
- 2 Gasoline piston engines with jet exhaust
- 3 Heavy-fuel (diesel) piston engines
- 4 Heavy-fuel (diesel) piston engines with jet exhaust
- 5 Liquid-fuel\* turbo-prop engines
- 6 Liquid-fuel\* turbo-jet engines
- 7 Liquid-fuel\* double-contour turbo-jet engines (with secondary low-pressure compressor on turbine)

### B Auxiliary or Special-purpose Engines

- 1 Liquid-fuel\* direct-flow air-jet (ram-jet) engines
- 2 Liquid-fuel\* pulse-jet engines
- 3 Solid-fuel<sup>†</sup> (powder) rocket engines
- 4 Liquid-fuel\* rocket engines (sometimes also used as primary power plants)

### C Experimental Engines

- 1 Gasoline jet-driven propeller engines
- 2 Liquid-fuel\* motor-compressor jet engines

\* These include gasoline, kerosene, or (rarely) alcohol, sometimes mixed with one of the following: liquid oxygen; hydrogen peroxide; or nitric acid

<sup>†</sup> A special type of slow-burning gunpowder

consultations are also held with production engineers with regard to the produceability in order to determine the most expedient materials, methods of manufacture and assembly. The finished drawings of parts, sub-assemblies and over-all views of the machine are passed to the production group of the department, which works out production processes for the experimental plant. Further approval of the finished working drawings and production plan is required of the head of the experimental plant or its chief engineer, and the chief production engineer.

The planning department of the Institute sets the time for initiating the production of the new machine at the experimental plant, and develops time schedules for the preparation of parts in its shops. At the same time, it distributes orders for parts produced elsewhere, along with necessary drawings and specifications. Further scheduling of assembling and testing at the Institute, and preliminary dates for post-test revisions and final government tests are also set by this department. In the process of manufacture and assembly, account is taken of errors in the designs and difficulties encountered in manufacture. Changes may be made in the working drawings and production processes at this time.

The assembled machine (in the case of an engine) goes to the testing station for testing under conditions of: (1) driven runs; (2) power runs without load; and (3) power runs with load. The important designers participate in the testing, whose regimen is worked out beforehand, but can be altered during the course of the test.

After testing, the machine is disassembled and all parts are carefully examined, with measurements made of those subject to wear. Sometimes partial or complete disassembly and reassembly takes place during the testing. The tests and their repetitions may call for the replacement of certain parts by new designs, or even a fundamental redesign of the entire machine, although this is rare. This entire process is known as bringing it into shape for government tests.

When the machine has been "brought into shape," the government tests begin. In addition to the leading designers and other officials of the Institute there are usually present representatives of the Chief Administration, the Ministry of the Aviation Industry, the military establishment which ordered the new design and, in particularly important cases, representatives of the Soviet Government.

After the government tests are finished with favorable results (which is usually the case, since a machine which has not been "shaped up" is not put through government tests), all drawings, with the comments and conclusions of the state testing commission, are transferred to the Series Production Department.

This department conducts a production analysis for series output of the machine and, in conjunction with the plant chosen to manufacture the product, installs its production plans, gives technical assistance in setting up production, observes the output of the initial models, and assists the plant in modernizing it.

Sometimes, especially if the required production operations are complex or untested, or new materials are being used, the initial series of machines (usually 10 to 25 units) is manufactured at the Institute's experimental plant. In these cases a careful study is made of peculiarities and difficulties encountered, and a perfected production plan is sent off to the manufacturing plant. Subsequently, the producing plant maintains a close liaison with the Institute through the Department of Series Production, and clears all changes to be made in the design of the machine or in the production processes. In practice such clearance is obtained only for major modifications. Small changes of little importance are carried out by the series-production plant's own designing and production planning apparatus. The Institute may be informed of such changes only after they have been introduced or, if the plant is very distant, not at all.

It should be noted that the basic ideas and general parameters of the new model do not always originate with the main designer. Often, the required basic parameters and "tactico-exploitation" characteristics originate with the agency ordering the new design (primarily the Air Force) and are sent to the Institute in the form of a directive from the Minister of the Government.

## CHARACTERISTICS OF SOVIET JET AIRCRAFT ENGINES

The centralized designing of aircraft in TsAGI was organized in an analogous manner prior to the war. Designing work conducted in aircraft and aircraft motor plants was also similarly organized, except the plants may receive from "above" not only projected requirements, but sketch drawings or technical designs as well from an institute or other plant.

The considerable growth of the aviation industry during World War II revealed the close interdependence and the need for joint solution and development of all three elements in the creation of machines: design, production processes, and production organization. Two problems—the interchangeability of detail parts and the aggregation of machines—reflect this close interdependence.

The problem of interchangeability was solved long ago in engine construction, and finds its widest use there. Interchangeability in airframe construction began to spread with the introduction of large-series production at the beginning of the 1930's and especially in mass production plants during the Second World War. It became possible only after the standardization of interchangeable parts and the development of an elaborate system of tolerances, fits, and mating-surface smoothnesses.

The problem of aggregation was also solved in engine construction before it was in airframe construction. By the 1930's such engine aggregates as magnetos, carburetors, oil pumps, propeller regulators, electrical generators, vacuum pumps, compressors, etc., with specific characteristics and type-sizes were being used for different modifications of Soviet engines.

The aggregation of airframes is a more complex affair, especially if the aggregates are to be interchangeable. Airframe aggregates differ from those of other machines by their large dimensions, complex spatial forms, and large number of junctures. In order to ensure their interchangeability, it is necessary for the plant to have a well-developed organization of pro-

| Engine Designation(s) | Designer (or Adapter) | Year First Produced* | Thrust Ratings lb  | Description               | Foreign Prototypes, If Any |         |
|-----------------------|-----------------------|----------------------|--------------------|---------------------------|----------------------------|---------|
|                       |                       |                      |                    |                           | Engine Designation         | Country |
| JET ENGINES           |                       |                      |                    |                           |                            |         |
| M-003                 | .....                 | (1947)               | 3,000; 3,500       | co-axial jet              | Jumo-004                   | Ger.    |
| M-004                 | .....                 | (1948)               | 4,000              | axial-flow turbojet       | BMW-003                    | Ger.    |
| M-004R                | .....                 | c. 1948              | c. 4,000           | axial-flow turbojet       | Jumo-004                   | Ger.    |
| M-014                 | .....                 | c. 1947              | 6,000+             | .....                     | BMW-004                    | Ger.    |
| M-018                 | .....                 | c. 1947              | 6,000+             | axial-flow turbojet       | Jumo-004                   | Ger.    |
| M-028                 | .....                 | c. 1947              | 3,000              | .....                     | BMW-028                    | Ger.    |
| RD-45*                | .....                 | (1950)*              | 6,000              | centrifugal-flow turbojet | Rolls-Royce "Nene-1"*      | Eng.    |
| RD-500†               | .....                 | (c. 1947)            | 3,500 <sup>†</sup> | .....                     | Rolls-Royce "Derwent"      | Eng.    |
| VK-1                  | Probably Klimov       | (1951)               | 6,000              | centrifugal-flow turbojet | .....                      | .....   |

\* Parentheses around dates signify the date of production of the earliest aircraft equipped with the engine, in lieu of finding a specific statement of the production date of the engine.

\* The Nene-1 engine was immediately prepared for production under the Russian designation RD-45. However, since then improvements in the engine have been made by the Soviets (for example, increasing the thrust rating from 5,000 to 6,000 lb), so that the latest RD-45 models may no longer be considered simply as the Nene-1 with a Soviet designation. (Jane's 1952/53.) The production date refers to the Soviet version.

† Rating of English prototype. Probably greater for Soviet engine.

duction, especially in regard to measurement, jigs and fixtures, and quality control.

As has been indicated above, the organization of production is, more than anything else, the weak link in Soviet plants. However, the tendency towards airframe aggregation, noticeable even before the Second World War, got an impetus during the war and was introduced to a certain degree. It has continued to develop in the postwar period.

At first, aggregation served for the most part as a means of modifying aircraft. It was of a "design" nature and had a somewhat spontaneous character. Modification frequently was carried out independently by the consumers of aircraft (i.e., by units of the Air Force and by the workshops of the Civil Air Fleet). But even before and during the course of the war there appeared a tendency toward "technological" aggregation.

Towards the end of the war and in the postwar period the ideas of aggregation and interchangeability became one of the premises included in the working out of designing and technology of aircraft. At the present time Soviet specialists conventionally regard aircraft design as consisting of three major elements:

- (1) the design of the airframe and the power plant installation;
- (2) the flight control and power-plant control systems;
- (3) the aggregates and mechanisms for fulfilling special functions (fire control, aerial photography, communication, observation, etc.)

(Turn to page 154, please)

# Turbo Gas Generator for Tip-Jet Helicopters



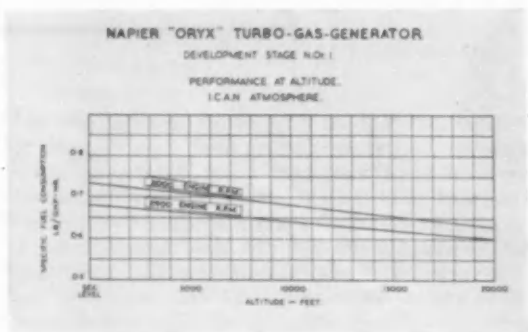
Napier Oryx turbo-gas-generator. Starter motor and accessories are at the extreme left. The collector, between the turbine and auxiliary compressor at the right, supports the two-way valve.

By David Scott

**D**ESIGNED primarily for tip-jet helicopter applications, the Napier Oryx single-shaft gas turbine combines the thrust of exhaust gas with air delivered by an auxiliary compressor to give a maximum of 750 gas hp at 21,900 rpm, and a gas mass flow of 14.4 lb per sec under take-off conditions.

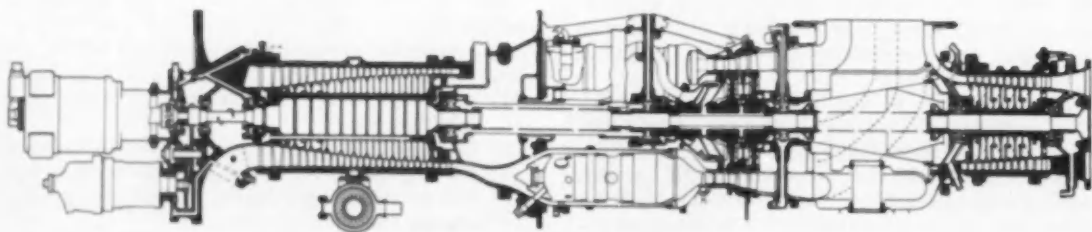
It is intended to realize the optimum advantage of this type of rotor propulsion, which eliminates all mechanical drive from the engine with resultant saving of weight, improved reliability and reduced maintenance costs. Details of the Oryx have been revealed by D. Napier & Co., Ltd., England.

The engine consists of a 12-stage axial main compressor, five combustion chambers, a two-stage turbine, and a four-stage axial auxiliary compressor. A



collector is placed between the turbine and auxiliary compressor. This ducts the exhaust and air upwards through separate volutes, with the internal baffling arranged so that the compressed air surrounds the hot gases and thereby cools the outer sheet steel casing.

(Turn to page 115, please)



Longitudinal section through Napier Oryx engine.

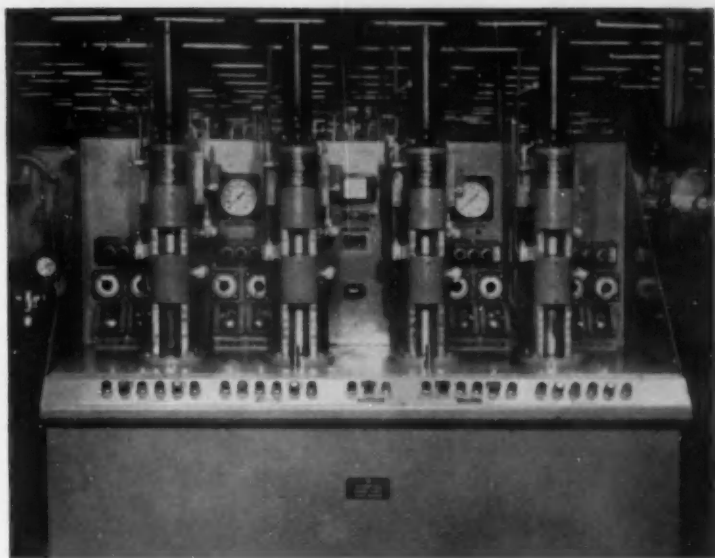
**A** NEW and unique self-contained, self-adjusting valve tappet, developed by Thompson Products, may be used in new passenger car and truck engines. This tappet, called the Novamatic, makes use of a high viscosity silicone fluid in a sealed construction instead of utilizing engine oil for operation.

The design of the automatic adjusting tappet was started over three years ago. It went through 15,500 hours of laboratory engine time and 588,000 vehicle miles before it was accepted for production.

For the design of the tappet and a description of its operation, it is best to refer to the accompanying line drawing of the cross-section of the tappet. While the exhaust or intake valve of the engine is being lifted off its seat, a tappet valve (C) carries the load of the push rod. During the lift cycle, the silicone polymer moves from a high pressure chamber (B) thru a leakdown clearance (1) into a low pressure chamber (A).

After the tappet has reached the closing ramp of the cam and the poppet valve has reseated itself, the tappet return spring (E) raises the tappet valve (C) which then creates a recovery passage (2). The silicone polymer returns from chamber (A) to chamber (B) through this opening. A choke spring (D) returns the choke ring (H) to its seat against the tappet valve race (C). The tappet is then ready for the next lift cycle.

According to Thompson engineers, the amount of tappet leakdown during the valve lift cycle is comparable to the leakdown of conventional hydraulic tappets. No special camshaft design considerations are necessary other than the cam ramp design normally used for hydraulic tappets. It is said that the silicone polymer—of an extremely high viscosity—is the chief factor in the excellent operating characteristic obtained with this tappet. The fluid is sealed in

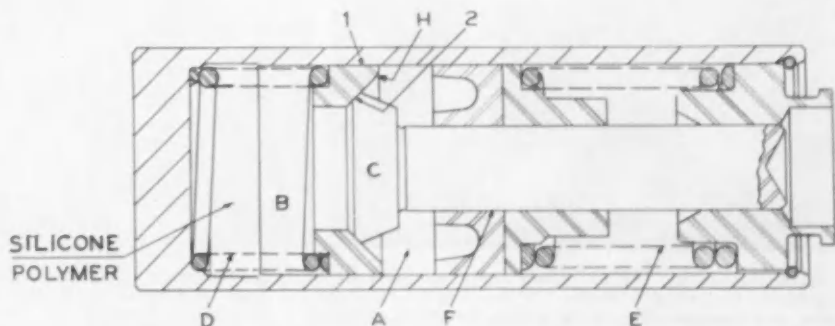


Thompson four-station silicone tappet filling machine

## Self-Adjusting Valve Tappet Filled With Silicone Fluid

the lower half of the tappet by a cup seal (F). A tappet return spring (E) keeps the fluid under pressure at all times. The fluid is sealed within the tappet; therefore, it does not have to be replenished nor does it become contaminated. Because of the sealed construction, the special oil gallery generally used with hydraulic valve tappets need not be drilled in the cylinder block.

The tappets were given 73 individual cold start tests at -20 F following 24-hr engine storage in the  
(Turn to page 118, please)



Cross-section of the Thompson Products Novamatic valve tappet





One of the big uses for wire stitching machines in the passenger car industry is for sun visor production. Here two Bostitch Bliss semi-automatic machines are used to fasten steel strips to the tops of fiber board sun visors at Diversified Products Co., Detroit. The piece of 0.032 in. steel is joined to the 0.110 in. fiber board at the rate of 900 visors per eight hour day per operator.



Left—Approximately 175 fiberboard glove compartment boxes are turned out each hour by the Bostitch Bliss wire stitching machine at Diversified Products. The operator must fold the box made of 0.070 in. thick material, staple the bottom to the sides, and complete the job by stapling the flaps. Eighteen stitches are used for the job. Right—Cotton batting and sisal are fastened to a burlap outercovers for automobile seats by hand stitchers. Two operators produce 1200, 32 by 66 in. pads per day at Premier Products Co., Detroit. This method is said to be 100 per cent faster than the former gluing process.

## ..... Stitches for

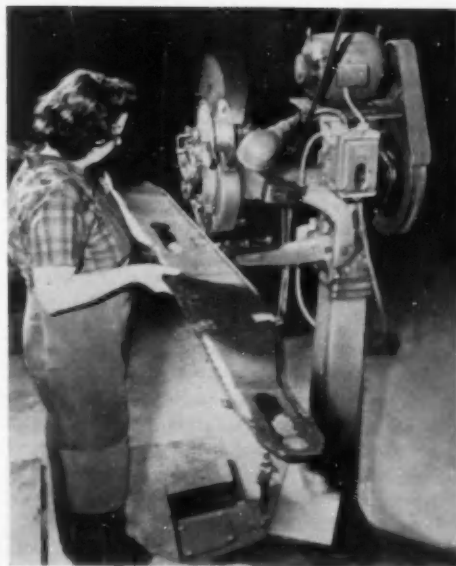




A gun-type hand stapler is used to temporarily fasten the tops and bottoms of fiberboard air-conditioning duct at Barnum Bros. In addition to 18 staples put in the work, glue is used in the seam to make the duct air-tight.

Below—After the manual tacking operation, the air-conditioning duct is removed from the fixture and thoroughly stitched on a Bostitch Bliss machine. Eighty staples are put in each duct. About 600 ducts are produced per eight-hour day.

## Car Part Seaming



# What's Coming in 1956 Chrysler Corp. Cars

**A**PPEARANCE modifications involving considerable tooling, but short of a completely new die program, distinguish the 1956 Chrysler Corp. lines. The cars were shown to the press at the Chrysler Proving Grounds west of Detroit on September 12.

As has been customary in previous years, no photographs of the new models, horsepower or torque ratings, or engine displacements were made available. Photographs and more complete data will be released later by individual Chrysler divisions and will be published in **AUTOMOTIVE INDUSTRIES**.

Principal appearance changes across the five car lines are in rear end design with fenders and deck lids higher and more massive. Grilles have undergone some modifications, and side treatment of moldings also provides a variation from 1955.

Outstanding new model addition is a four-door hardtop convertible in all lines. An unusual feature of this model is that the rear side window is full-sized but, through a unique arrangement, can be lowered completely into the door.

Other features common to all lines are new safety door latches, instrument panel push-button control for automatic transmissions, 12-volt ignition, a new power brake unit, and pull-out type door handles.

An interesting new accessory to be offered this year is a high-fidelity record player developed by CBS and which will be an exclusive to Chrysler for one year. The unit mounts under the instrument panel and plays recorded music through the amplifier and speaker of the car radio. Through a new design principle, the player and the position of the stylus are not affected by the angle, speed, or cornering of the car. The unit will provide from 45 minutes to one hour of recorded music with special seven-in. records produced by CBS. Turntable speed is 16 rpm.

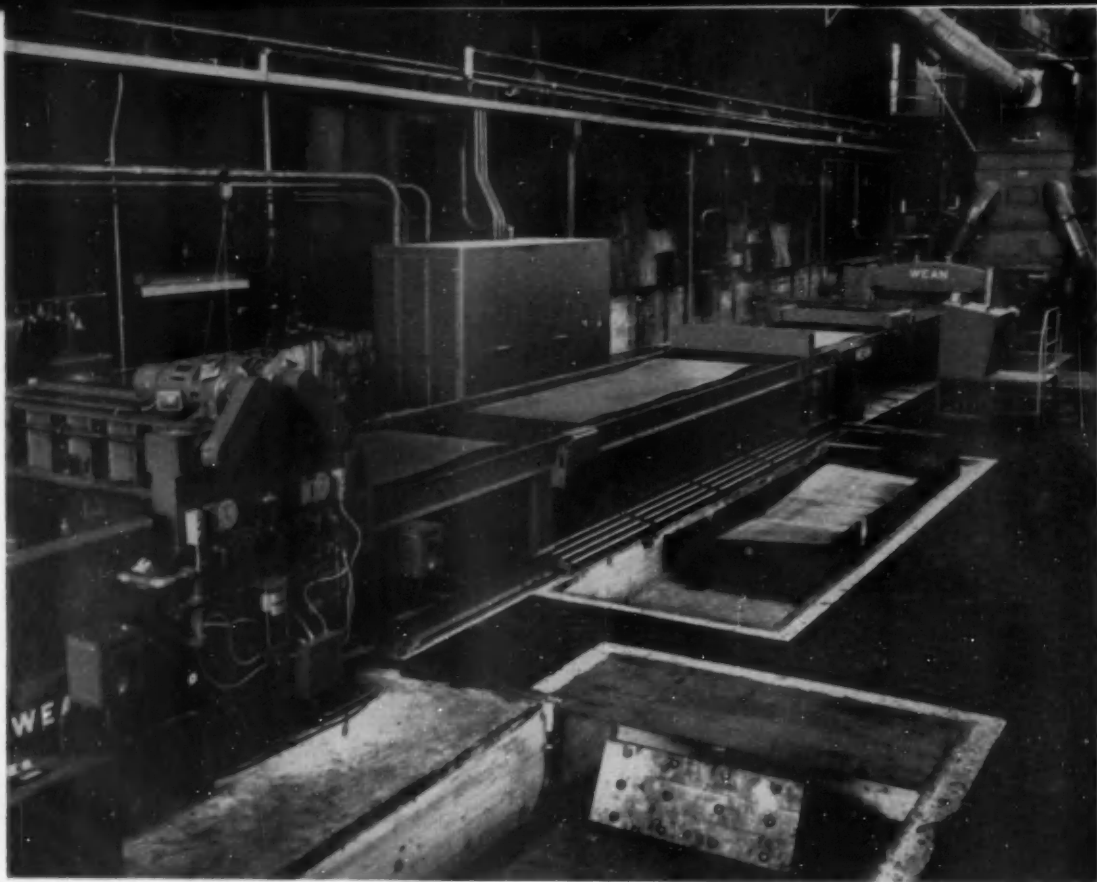
### Mechanical Developments

Plymouth has a completely new single rocker arm V-8 power plant of larger displacement than in 1955 models. The six-cylinder engine will also be retained, but compression ratio has been increased.

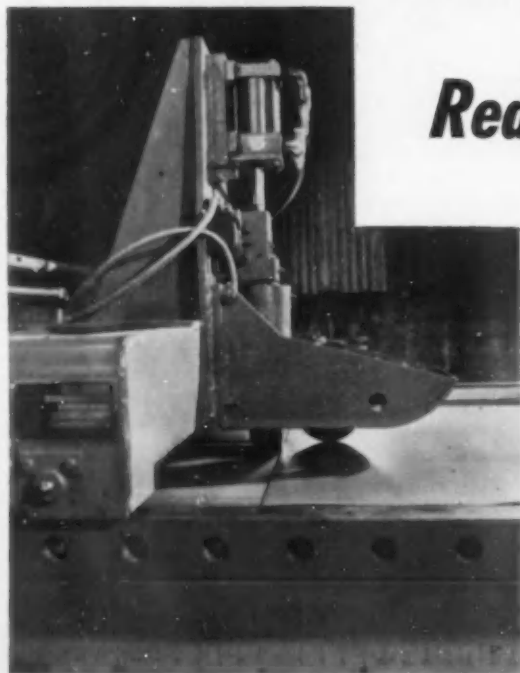
Dodge will offer a new V-8 of larger displacement in addition to the 270 cu in. V-8 used in 1955 models. Both are of single rocker arm design. The Dodge six-cylinder engine will be retained in the line.

De Soto will offer two V-8 engines, the Fireflite and Firedome, both of double rocker arm design. Both engines have the same compression ratio, but the Fireflite is equipped with a four-barrel carburetor.

(Turn to page 182, please)



Overall view of the line from the Pangborn unit on the right to the oiler on the left.



This unit is used in conjunction with the gaging table to automatically measure the desired length of steel before shearing.

## Redesigned Cut-Up Lines

**I**N recent months there has been much activity devoted to the redesign of cut-up lines for body and frame stamping plants in the automobile industry. One of the first, if not the first, to be completed was at the Parish Pressed Steel Div., Dana Corp., in Reading, Pa. This line, which very recently went into operation, contains some of the most modern equipment available today for initial steel handling operations. As pointed out by the Parish executive staff, the line provides maximum flexibility and production efficiency for the Parish plant.

Basically, the line was made up of Wean and Pangborn machinery with Reliance motors, drives, and controls. The initial operation on the line is performed by a Wean entry pack conveyor and sheet feeder. This unit provides interim storage for two packs of steel as well as the pack being fed. Automatic feeding of sheets and plates up to five ft wide and 20 ft long is done by a vacuum pickup. The cantilever design of the unit also permits manual feeding of large plate stocks up to four ft wide and 40 ft long.



At the beginning of the cut up line, Parish has installed a Wean entry pack conveyor and sheet feeder for sheet and plate, and a payoff reel for strip. Note the drawbridge conveyor over the payoff reel.

## *in Body and Frame Plant*

**Parish Pressed Steel  
Division of Dana  
Corp. Installs Latest  
Equipment for Initial  
Steel Handling Op-  
erations**

Coil stock can also be fed through the equipment by means of a Wean payoff reel. This unit has been installed between the sheet feeder and an entry flattener. A conveyor has been mounted over the payoff reel in drawbridge fashion to handle the sheets and plate stock.

An automatic peeling device has been provided to pick up the leading edge of the coil and start it through the entry flattener. Another automatic device, an Askania edge control unit, controls the movement of the uncoiler unit to keep the strip on the center of the cut-up line.

The entry flattener, which is the next unit in the line, has been specially designed with three rolls on the top and two on the bottom. According to the Parish production people, this provides a reverse bending action to eliminate problems that might otherwise be experienced because of "coil breaks" in the inner laps of the material.

To obtain clean mill-scale-free stock, a Pangborn Rotoblast eight-wheel shot-blast cleaning machine was

purchased for the line. This unit utilizes S170 round steel shot for mechanically cleaning mill scale from the sheet, plate, or strip having variable widths.

After leaving the Pangborn machine, the material passes over a humped table, a special design to handle sheet and strip, and goes to a 72 in. upcut shear. This machine, designed to give either a straight or angular (up to 15 deg) shearing action, has a capacity of up to  $\frac{3}{8}$  in. gage plate. This shearing unit, as well as other machinery on the line, utilizes Farval central lubrication equipment.

A gaging table has also been installed on the processing line for cutting the stock to any desired length as well as automatically shearing off the first 12 in. of coil stock. The leading edge of the coil, thus sheared, is automatically rejected as it leaves the gaging table. The reject conveyor is also utilized for other material which does not pass the rigid Parish

quality inspection standards.

Next machine on the line, a 17-roll McKay leveler with double backed up rolls, gives absolutely flat sheets that can be readily used in the Parish presses. When recoiling strip stock, the leveler is used to provide tension to obtain a tight coil.

An oiler and dryer are used in the setup to lubricate and clean the sheet for the press operations. The oiler, equipped with a Vickers pump, puts out a large volume of the lubricant at high pressure. The particular product used for the lubrication and mechanical cleaning action was developed by Reilly, Whitman and Walton. It gives a uniform phosphate coating and provides an animal fat lubricant in one pass through the oiler. Oil is maintained at 180 F and is pumped out at 70 psi at the rate of 150 gpm.

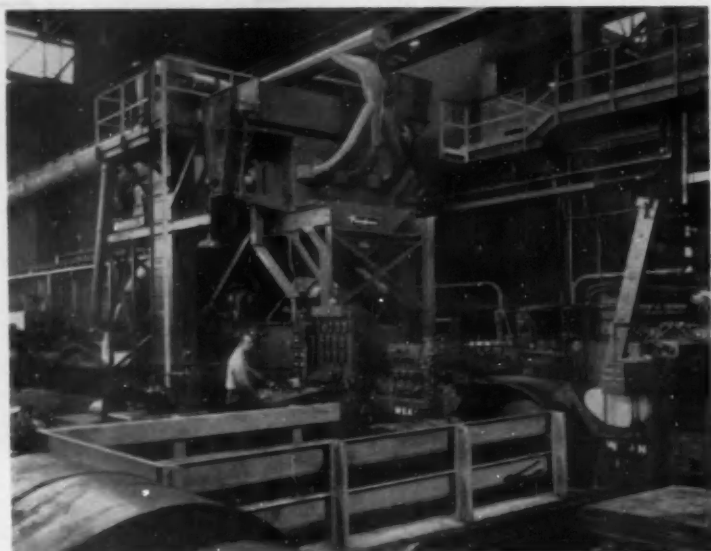
For strip stock, a recoiler with an Askania edge control unit has been provided. For other stock, a stacking and transfer conveyor has been incorporated in the line. This unit automatically provides for dropping one sheet on top of another, without edge striking, in order to maintain the even lubricant film.

Electronic controls have been provided to record the line speed and minutes of cleaning time. These controls can be utilized to stop the line at a predetermined number of sheets.

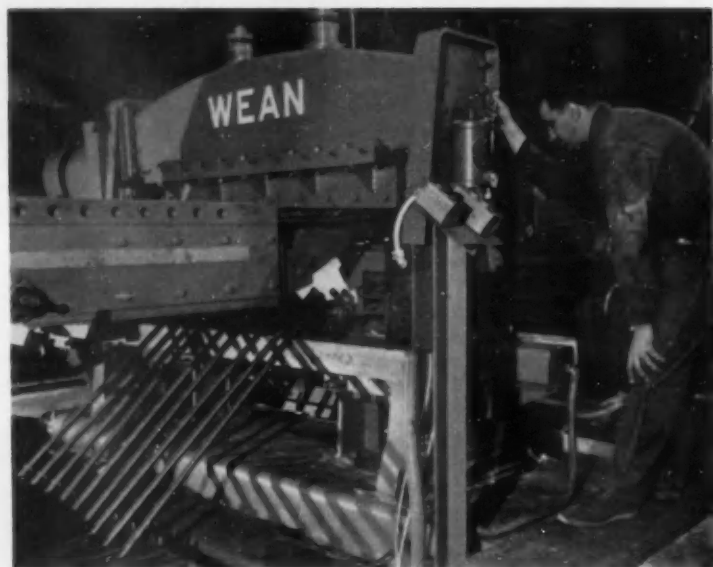
### **Ford Employment Drops, But Payroll Hits Peak**

Ford Motor Co. has reported that its hourly employees earned an average of \$106.22 a week during the first six months of 1955. The total payroll for those workers reached a record \$373.942 million.

The figures included an average of 131,375 hourly workers from the lowest to the highest classification who



*For mechanical cleaning of mill scale from the steel a Pangborn eight-wheel Rotablast is used with S170 steel shot.*



*A Wean shear of 72 in. width capacity installed in the plant was designed for straight or angular cutting.*

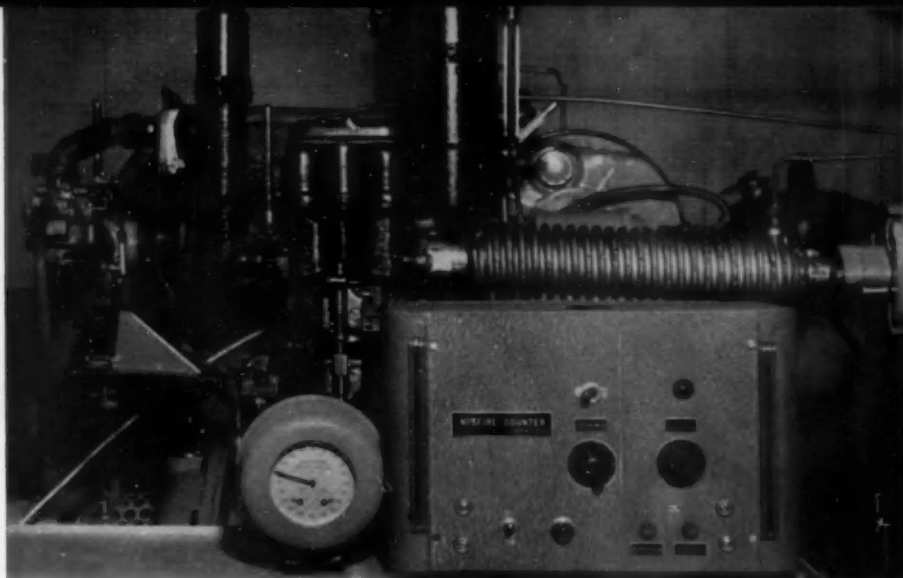
worked an average of 44.9 hours a week. During the comparable 1954 period, hourly employment averaged 132,739, and hours worked totaled an average of 41.6 hours a week.

### **Borg-Warner Sales Soar 37 Per Cent**

Boosted by high automobile production, sales and earnings of parts sup-

pliers continue to rise. Latest among such companies reporting substantial gains is Borg-Warner Corp. Its sales in the six months ended June 30 climbed by more than 37 per cent to \$267.6 million from the \$194.7 million in the like 1954 period. Earnings in the period were nearly double those of the same time last year in rising to \$17.8 million from \$9.9 million last year.





Installation of the misfire counter on a C.F.R. single-cylinder research engine

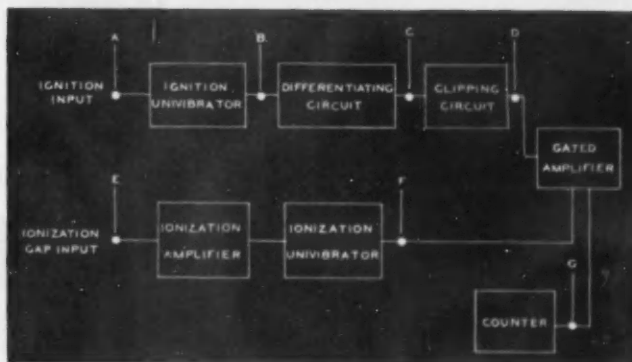
Below — Misfire-counter block diagram

## ELECTRONIC MISFIRE COUNTER

*Saves Time  
in Spark Plug Tests*

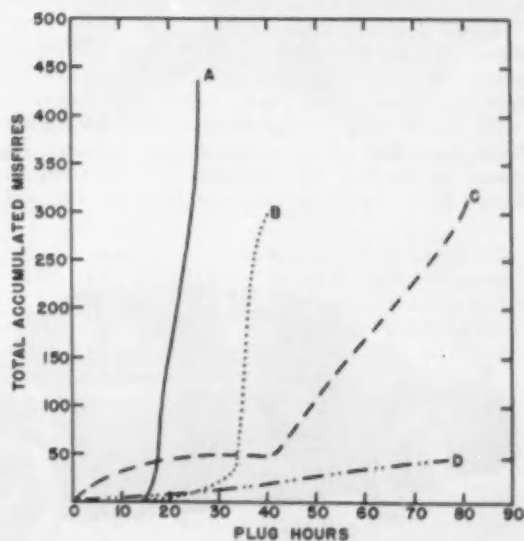
By Keith G. Parthemore

Petroleum Laboratory  
E. I. duPont de Nemours & Co., Inc.



THE problem of spark plug fouling in internal combustion engines and the search for methods of improving spark plug reliability have brought about a need for instrumentation to detect fouled plugs and to indicate quantitatively their effect on engine performance. The duPont Petroleum Laboratory developed an electronic misfire counter which is capable of detecting and recording misfires that occur in a single-cylinder research engine. The term "misfires" in this sense refers to impulses of electrical energy from the ignition system that do not ultimately ignite the fuel charge in the combustion chamber. If the ignition and fuel induction systems of the test engine have been carefully checked for proper operation such misfires are attributable to spark plug failure. Since the criterion of spark plug performance is whether or not the plug causes misfiring, a quantitative evaluation of the effect of a fouled plug on engine performance is obtained by recording the number of misfires

(Turn to page 108, please)



Effects of four different fuel additives on spark plug life



**By Edward Janicki**

*Pontiac Bonneville Special is still being used in shows.*

## WHERE ARE The Dream Cars?

**W**HAT has happened to all the "idea" cars, on which the automobile industry has spent millions to test public reaction? The futuristic experimental models which once graced the floors of some of the world's biggest automobile shows have slowly been dropping from the limelight to give way to new designs. At least half of the nearly 50 dream cars built by the Big Three alone have fallen into oblivion.

Of the 11 "cars of the future" built by Chrysler Corp., only two of them are in this country—the classic K-310, first Chrysler idea car conceived by Stylist V. M. Exner in 1949 and built in 1951, and

*Mercury Monterey XM-800, one of the Ford Motor Company's three experimental cars remaining on the road.*



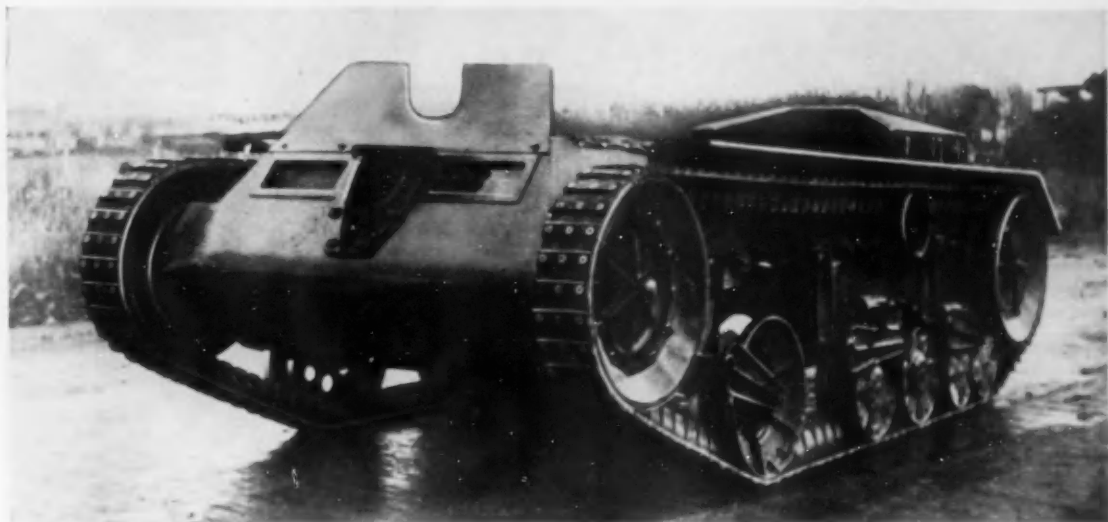
the squatty De Soto Adventurer I, built in 1953. Both cars, embracing an entirely new concept in modern automobile design, are under secret wraps again in Chrysler's engineering department. All other Chrysler-built cars, except the Firearrow Roadster mockup,

have been sold to the corporation's overseas distributors in Portugal, Honolulu, Saudi Arabia and other countries. These include the Chrysler Special Sports Coupe and d'Elegance — considered the most expensive cars of the Chrysler family—the C-200, Firearrow Roadster, Firearrow Coupe, Plymouth Explorer, Firearrow

(Page 122, please)

*Chrysler K-310, now in the Corporation's engineering department.*





Miniature Swiss Army Tank VP 90.

## Small Swiss Tank Operated by Two Men

**A**TINY, rubber-tracked carrier, designed by Fouga Béziers (France), Rexim, S.A. (Switzerland) and Porsche, K.G. (Germany), is presently undergoing exhaustive tests and trials in Swiss mountains.

Its low first cost (\$3500-4000 without armament), extremely low height of less than 40 in. and 120-in. overall length, mounting small anti-tank weapons in firing position, make for rapid dispersal of troops in case of atomic attack.

The V.P. 90 Voltigeur-patrouilleur incorporates various automobile units, including a standard 91.54 cu in. Porsche aircooled 50 hp. engine and a four-speed synchro mesh transmission with fluid coupling between clutch and transmission.

The rubber tracks are driven from rear sprockets, the front sprockets being provided with convenient tension adjustments. The reinforced, shallow welded steel hull is protected in front by 3½-in. armor plate. Steering is accomplished by braking one track only. Driver and gunner lie prone on inclined mattresses.

Armament consists of recoilless anti-tank weapons—bazookas or small rockets. By shifting the front suspension point, the nose of the tank may be raised or lowered, providing the required elevation for firing position, and also permitting clearance underneath low barriers and obstructions.



This illustration shows small size of tank as compared to soldiers.

The vehicle can turn within an 80-in. circle. Its weight, fully loaded with two-man crew, armament and fuel is only 3300 lb. Top speed, on good roads, is said to be 57 mph. Maneuverability in difficult terrain is excellent, but the combination steering and braking system is apt to present problems.

At the present time a number of these machines are being built for the French Army.

### \$20,000 in Scholarships To Be Awarded By ASM

Metallurgy scholarships totalling

nearly \$20,000 will be awarded to 49 leading engineering schools by the American Society for Metals. This marks the third consecutive year the

scholarships will be given out by ASM as part of its program to stimulate greater interest in metallurgy. Each scholarship is worth \$400.

**By W. F. Bradley**

Special European Correspondent  
for AUTOMOTIVE INDUSTRIES



The 1956 model Renault with piston displacement of engine increased to 130.5 cu in.

## NEW RENAULT

### *Offers Electro-Magnetic Clutch as Optional Equipment*

**T**HE Ferlec electro-magnetic clutch, developed by the Ferodo Brake Lining Co. will be optional equipment on the 45.7 cu in. rear-engine Renault to be

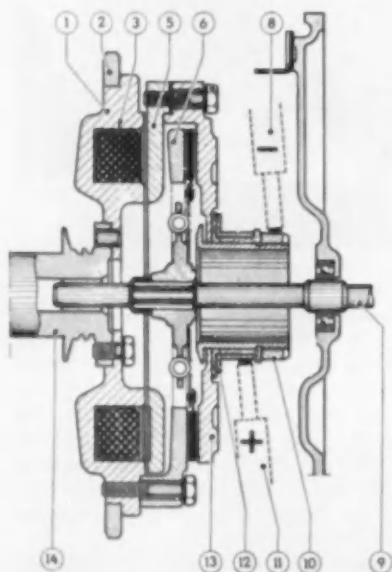
PARIS, FRANCE

presented at the Paris Salon next month. This is the best selling car in France, averaging 600 per day, and is the first low-priced European automobile to have two-pedal control.

The Renault Fregate, production of which is 158 per day, will in future be produced in two ranges, one with the original 122 cu in. engine and the other with piston displacement increased to 130.5 cu in. The engine is rated at 77 hp. A station wagon has been added to the line. Four commercial types for useful loads up to 2½ tons are continued with either the 45.7 or the 130.5 cu in. engine. Total production of these various commercial types is 188 per day.

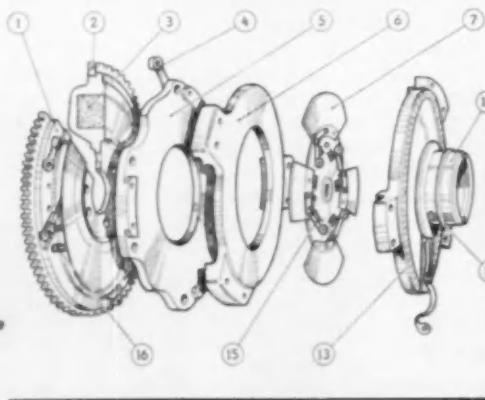
The Ferlec clutch has the same overall dimensions as the standard friction clutch which it replaces. Main assemblies are: a steel flywheel with a circular coil

(Turn to page 116, please)



Longitudinal sectional view of the Ferlec clutch

- 1—Flywheel
- 2—Starter ring gear
- 3—Coil
- 5—Armature
- 6—Intermediate plate
- 8—Carbon brush holder
- 9—Gearbox shaft
- 10—Collector ring, grounded
- 11—Carbon brush carrier, positive
- 12—Collector ring, positive
- 13—Pressure plate
- 14—Crankshaft



Exploded view of the new clutch

- 1—Flywheel
- 2—Starter ring gear
- 3—Coil
- 4—Link
- 5—Armature
- 6—Intermediate plate
- 7—Friction plate
- 10—Collector ring, grounded
- 12—Collector ring, positive
- 13—Pressure plate
- 15—Adjustment plates
- 16—Light coil springs

# AC first and foremost again!



This AC specially designed 31-foot trailer houses machine shop, acoustical instruments, power tools and sheet metal working equipment. Has its own 110-volt a.c. power source of 3500-watt capacity. Total wt. 10,200 lbs.

## AC takes to the road to speed up service to industry

Now AC engineers can work with *your* engineers right at *your* plant . . . do an on-the-premises acoustical analysis and tailor-make a pilot model intake silencer for your new engine. Recognizing that the air-intake silencer is often the last item to be finalized, AC engineers have designed this new Mobile Laboratory which enables them to complete work in a few days which formerly required several weeks.

An AC combination sound-recording and towing dynamometer car hauls the Mobile Laboratory. Thus AC engineers have complete analytical equipment that can come right to your facility. Tape recordings of intake noises are made of your vehicle, and by playback method an AC intake silencer is mocked up right on the job.

It's another example of AC ingenuity and of AC interest in serving you. Feel free to contact any AC office on your equipment needs.

In the laboratory's sound-insulated room, playback of intake noise is repeated until all objectionable sound is removed by on-the-spot intake silencer modifications performed in the mobile machine shop.



Here an AC engineer uses the Mobile Laboratory metal-forming equipment to shape intake silencer modifications during noise-removal experimentation.



AC SPARK PLUG DIVISION  
GENERAL MOTORS CORPORATION

FLINT — 1300 North Dort Highway  
CHICAGO — Insurance Center Building  
DETROIT — General Motors Building

ADAPTERS (DRIVE) • AIR CLEANERS • AIR CLEANERS AND SILENCERS (COMBINATION) • AMMETERS • BREAKTHROUS (CAMMETERS) • CAPS (RADIATOR PRESSURE) • FLEXIBLE SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM BOOSTER PUMPS (COMBINATION) • FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—OIL (PRESSURE) • GAUGES—GASOLINE • GAUGES—OIL (PRESSURE) • GAUGES—TEMPERATURE (WATER, OIL) • OIL FILTERS (LUBE) • PANELS (INSTRUMENT) • DECOMPLICATING VACUUM PUMPS • ROTARY VACUUM PUMPS • SPARK PLUGS • SPEEDOMETERS • TACHOMETERS • TERMINALS (IGNITION SWIRL) • VALVES (CAMMETER VENTILATION)



VELVETRACE  
PRATT & WHITNEY  
MILLING MACHINE

**NEW! UNIQUE! PRECISE!**

## PRATT & WHITNEY VELVETRACE MILLING MACHINE

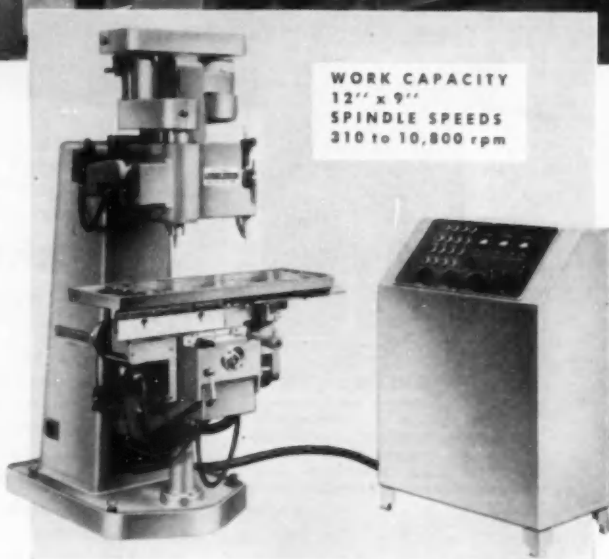
AN ENTIRELY NEW, UNIQUE TYPE OF TRACER CONTROL . . . follows the finest detail of any 3-dimensional model with extreme accuracy . . . but WITHOUT TOUCHING IT. Utilizes a short spark gap between tracer and model for control. Cannot damage any model, however soft or fragile, even when using the smallest diameter tracer. There is no mechanical motion in the tracer . . . and therefore no positional offset or time lag.

### AUTOMATIC OPERATION

Spindle, table and carriage are driven through new type, specially designed magnetic clutches which provide maximum sensitivity, continuously variable speed control, and eliminate backlash. Machine can be set to cut 3-dimensional shapes (including square walls) automatically with either table travel and carriage feed, or carriage travel and table feed. Spindle quill "roll feeds" in precision preloaded ball bearings . . . assuring that original high accuracy and rigidity are maintained indefinitely.

### SEND NOW FOR COMPLETE INFORMATION

Write on your Company letterhead for your free copy of Circular No. 590 . . . or phone the P&W Branch Office nearest you.



WORK CAPACITY  
12" x 9"  
SPINDLE SPEEDS  
310 to 10,800 rpm



## PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY  
WEST HARTFORD 1, CONNECTICUT, U.S.A.

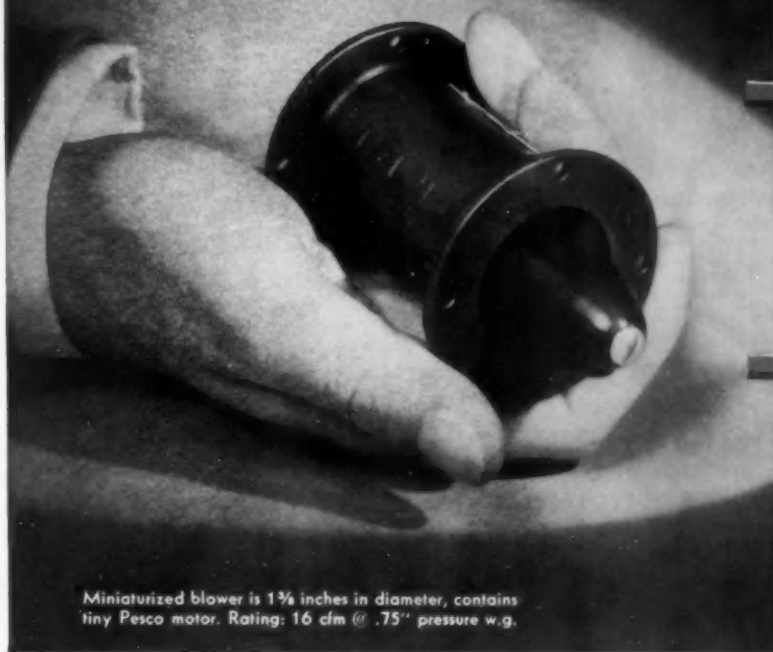
BRANCH OFFICES • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI  
CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH  
ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

FIRST CHOICE FOR ACCURACY  
SINCE



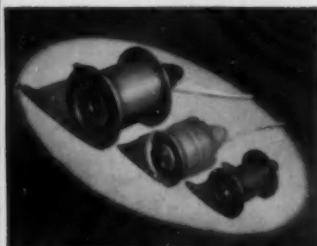
MACHINE TOOLS • CUTTING TOOLS • GAGES  
1860

**NOW YOU CAN GET BETTER COOLING!**



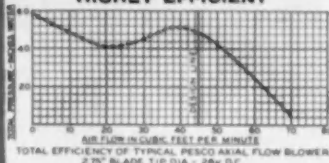
Miniaturized blower is 1 3/4 inches in diameter, contains tiny Pesco motor. Rating: 16 cfm @ .75" pressure w.g.

**COMPLETE LINE**



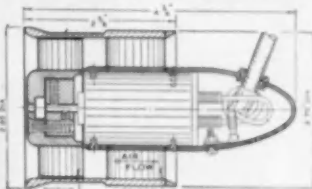
Units for a-c or d-c operation have capacities from 16 to 750 cfm.

**HIGHLY EFFICIENT**



Design assures efficiencies unexcelled in comparable "package" sizes.

**LIGHTWEIGHT, COMPACT**



High air displacement and pressure achieved with minimum size and weight.

## new Pesco axial flow blowers

More efficient air delivery or exhaust is possible with the new Axial Flow Blowers now manufactured by Pesco. Engineered by a leading British firm, these advanced design blowers have been proved under tough service conditions. They provide better cooling, heating or ventilating for a wide variety of aircraft and industrial applications.

Pesco® Axial Flow Blowers are self-

contained package units which save space and permit more flexible product design. They incorporate a rotor direct coupled to a Pesco Electric Motor for efficient air flow.

An outstanding characteristic of this new Pesco product is the high capacities obtained with minimum power. Careful aerodynamic design assures optimum efficiency with axial air flow. Pesco Blowers withstand severe conditions of shock, temperature, pressure, altitude, humidity and duty cycle. Rated for con-

tinuous operation at high ambient temperatures, they perform in any position. Dynamic balancing assures quiet, vibration-free operation. Flange or clip mounting is optional.

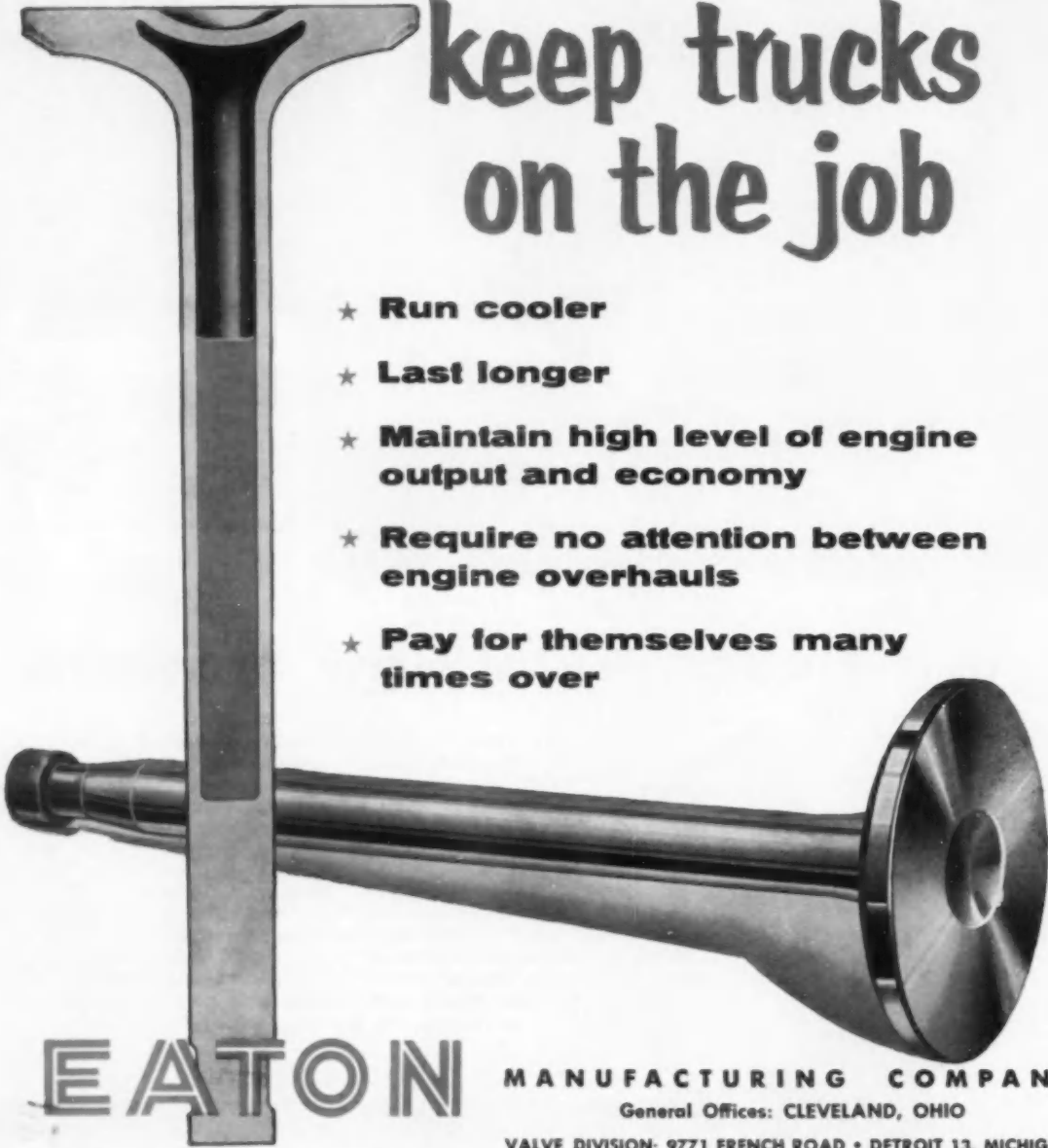
Before you proceed with the design or re-design of any equipment requiring localized heating or cooling, investigate the better performance now possible with Pesco Axial Flow Blowers. For complete details, contact your local Pesco representative or write: PESCO, 24700 North Miles Road, Bedford, Ohio.



**BORG-WARNER CORPORATION**  
24700 NORTH MILES ROAD • BEDFORD, OHIO

# Eaton SODIUM COOLED VALVES

## keep trucks on the job

- 
- ★ **Run cooler**
  - ★ **Last longer**
  - ★ **Maintain high level of engine output and economy**
  - ★ **Require no attention between engine overhauls**
  - ★ **Pay for themselves many times over**

# EATON

**MANUFACTURING COMPANY**

General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

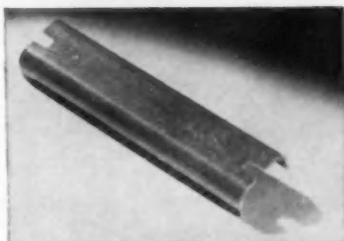


**PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

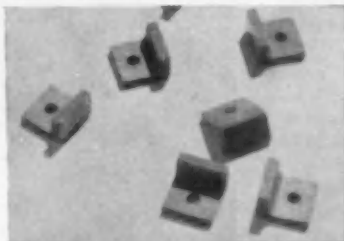


#### C-D-F MACHINES TO CLOSE TOLERANCES.

Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



**C-D-F PIONEERED IN POST-FORMING** of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

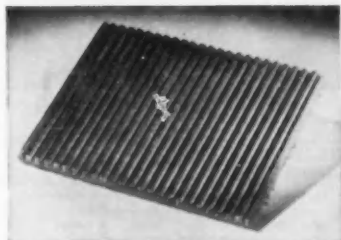


**C-D-F DOES THE UNUSUAL.** These rubbing blocks are made from fine-weave cotton cloth Dilecto molded tubing that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.



**C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING** of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

## Yes, C-D-F is a big reliable source for fabricated plastics!



**C-D-F SERVES MANY INDUSTRIES** with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



**C-D-F IS A PUNCHING SPECIALIST** on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



**C-D-F COMES UP WITH THE ANSWERS** to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.



### Continental-Diamond Fibre

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

## Farval gives you economical insurance on big capital investment in machines like this Wean Trapezoidal Shear

FARVAL—  
Studies in  
Centralized  
Lubrication  
No. 176

**D**EVELOPED as an answer to the high speed blanking of irregularly shaped pieces known as trapezoids or parallelograms, the Wean Trapezoidal Shear Line reduces tremendously the cost of expensive die setup in major blanking presses. Two pieces are made at each index with accuracy only achieved by a measured length indexing system. The cut can range from 45° to 90° angles—the latter setting establishes the line as a straight cut-up unit with twice the normal production of conventional shear lines.

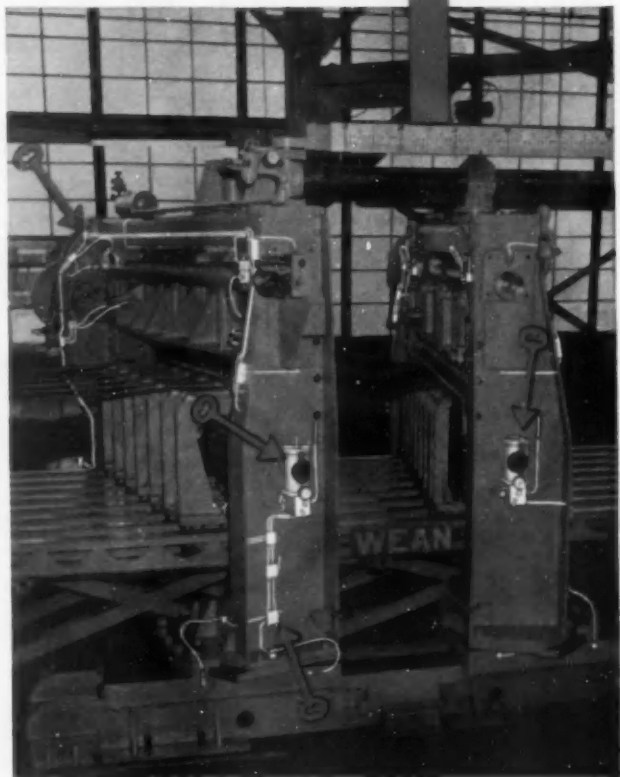
### Continuous Operation

To avoid shutdowns for oiling and for bearing repairs that go hand-in-hand with haphazard methods of manual lubrication, a Farval automatic lubricating system was installed. While the machine is in full operation, Farval lubricates—eliminating downtime for oiling, increasing bearing life, and allowing higher speeds by keeping bearings well lubricated.

Farval is the original Dualine system of centralized lubrication that delivers oil or grease under pressure to a group of bearings from one central station, in exact quantities, as often as desired. Simple, sure and foolproof, the Farval valve has only two moving parts—without springs, ball-checks or pinhole ports to cause trouble. Easy-to-see indicators at every bearing show that each valve has functioned.

Find out how Farval can help keep your equipment running continuously and provide economical insurance on big capital investment. Write today for free Bulletin 26. The Farval Corp., 3296 East 80th St., Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Co., Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



**KEYS TO ADEQUATE LUBRICATION**—Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine will be properly lubricated.

Photo shows the Farval on the Wean Trapezoidal Shear Line. The continuous belt travels at high speed and the stands which support it are also Farval equipped.





# News of the MACHINERY INDUSTRIES

By Thomas Mac New

Industry Has \$12,500  
Invested in Each  
Worker. Cincinnati  
Buys Heald. Niles-  
Bement-Pond Stock-  
holders Approve  
Merger with Penn-  
Texas

## Material Handling Sales Up

According to the latest chart put out by the Material Handling Institute, sales in May were 16 per cent higher than during the same month in 1954. The beginning of this year showed a rather slow start in sales. March, however, was one of the highest months ever recorded by the Institute. Members of the Institute are very optimistic concerning the high investment by industry in materials handling equipment. It is felt that with manufacturers constantly in search of cost reducing equipment, sales should continue to go up in the industry. Chart is reproduced below.

## Machine Tool Sales Off Prior to Show

The National Machine Tool Builders' Association reported a \$14 million drop in orders for the month of July in comparison with the 22-month record high set in June. The total for July amounted to more than \$63 million. With the current rate, it is expected that orders for the year should run higher than the \$709 million estimated some time ago. It was interesting to note that during July cancellations were at their lowest point in over a year and a half.

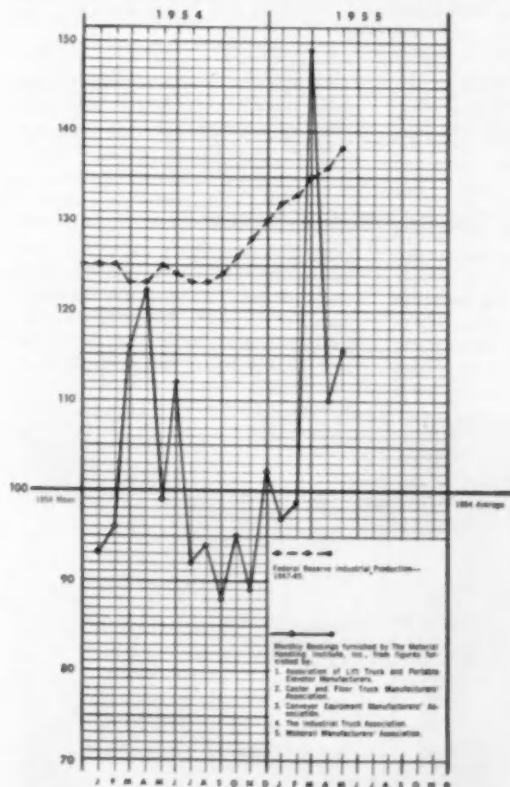
## Cincinnati Acquires Heald

Frederick V. Geier, president of The Cincinnati Milling Machine Co., announced that the plant of The Heald Machine Co., Worcester, Mass., had been acquired for cash by a subsidiary of the Cincinnati company.

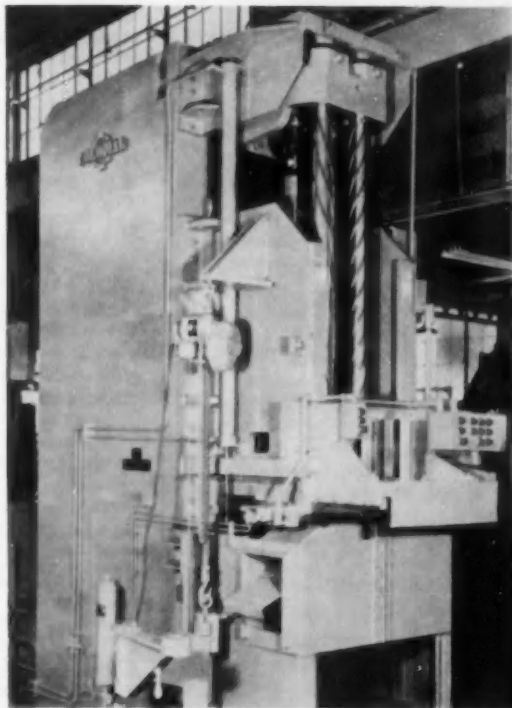
Heald is a well-known builder of precision boring machines, internal grinders and rotary table surface grinders. None of these machines are produced by the Cincinnati company.

Heald products will continue to be built and sold by The Heald Machine Co. organization, with Richard A. Heald as board chairman and Carles (Turn to page 144, please)

MONTHLY BOOKINGS INDEX REPORTED BY THE MATERIAL HANDLING INSTITUTE, INC.



Material Handling Institute monthly sales index



Internal helical automotive transmission gears are broached at 168 or 336 per hour, depending on the face width, on this RUF dual station Colonial machine. Note different lead bars for right hand and left hand helical gears as well as the exit chute below the work table.

**NEW****PRODUCTION  
and PLANT****EQUIPMENT**

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 93

**Plating Mechanism Is Standardized**

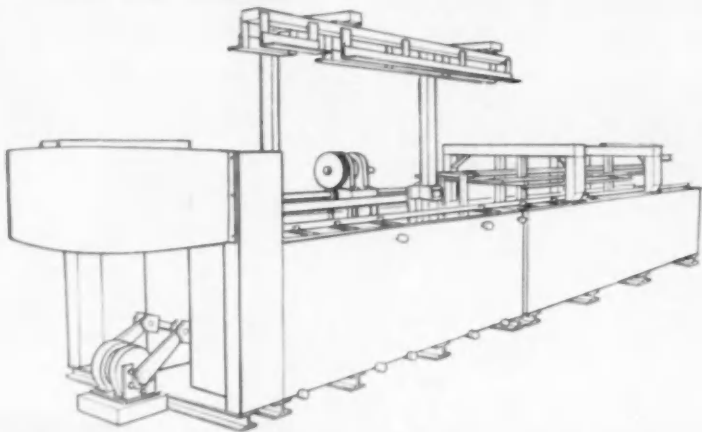
FULLY automatic plating mechanism, the Platocrat, incorporates most of the work-saving features of custom-built automatic plating conveyers. Among its unique features are: a replaceable plating tank which enables the plater to change from cadmium to zinc in minutes, without tank cleaning operations. One tank is simply pulled aside and replaced with a spare tank. The plating tank is electrically isolated from the rest of the mechanism to eliminate the possibility of stray currents. Three-point rail contact of work-carriers assures constant, dependable current flow. A versatile cycle allows as many as seven stations in both the pre- and post-plating cycle. Tanks are sectionalized at the factory to particular needs.

Racks are 12 by 6 by 30 in., provide big parts carrying area for higher production.

The machine is hydraulically powered. One three-hp motor runs the mechanism through two hydromotors, one for horizontal motion and one for vertical movements. All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. This carriage mechanism is suspended on rollers moving in a channel track.

Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station; a low cost, hydraulically operated automatic loader is available as optional equipment. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transferred and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. This sequence is simultaneously produced in reverse on the opposite side so that, when the lifting arms are lowered on one side, they are raised on the other side. In



*Platocrat automatic plating mechanism saves on engineering costs through standardized design.*

the end tank, the work-carrier is advanced by means of a reciprocating arcuate rail actuated with the carriage movement.

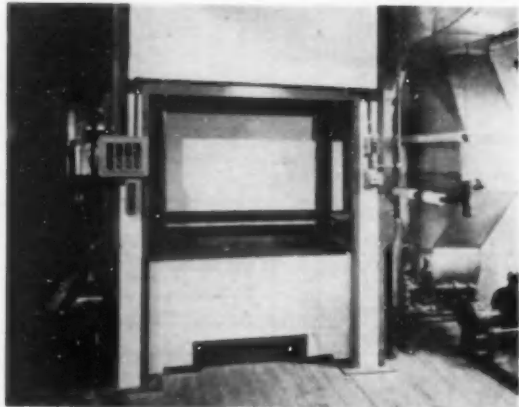
Lubrication is centralized. The machine requires only nine ft headroom. *Wagner Brothers, Inc.*

*Circle 26 on postcard for more data*

**Dip Coating ConveyORIZED**

THIS is a two-dip system for the application and drying of a primer and a finish coat to small parts at a high production rate. The equipment produces a coating of uniform thickness that is drain-free, and tear-

free, and dries it in an atmosphere independent of ambient humidity and temperature. Results are achieved through automatically controlled extraction angles and extraction speeds, and drying in a forced draft con-



*Front end of conveyORIZED dip coating equipment showing loading and unloading station. Pump for recirculation of finishes is on the right. Dip tanks are partially removed from machine at left. Heaters, blowers and ducts for baking labyrinth are at the right.*

trolled atmosphere. Air-conditioning equipment and auxiliary drying ovens are not needed.

This dip coating technique can be used for the application of protective or decorative coatings of lacquers, enamels, paints or varnishes, as well as various types of plastic coatings. Benefits claimed from use of the process include reduced coating material costs by elimination of overspray and minimization of diluent usage; reduced labor costs in handling and finishing; reduced make-up air costs; improved quality of work including uniformity and continuity of coverage; increased productivity for the same work areas.

The unit illustrated is 13 ft high and occupies 28 by 10 ft of floor space. Chain attachments permit one operator to load and unload work carrying racks on the internal dual chain conveyor. Lift doors give ready access to removable dip-tanks for servicing. Recirculation of coating materials in the tanks provides proper dispersion of pigments. Overflow drains, part of the recirculation system, provide for maintenance of constant level and removal of trapped air. *Applied Engineering Associates.*

Circle 27 on postcard for more data

## Air Control Valves

**M**ODEL 6668 solenoid bleeder, air cylinder-actuated, two- or three-way valves are announced for electric push-button, limit switch, timer, etc., control of bleeder and pilot-operated master valves. Removing a plug in lower (center) port makes a two-way valve into a three-way valve. Provision is made for side or base mounting.

Model 6669 dual-control two-way valve is similar except that it has two exhaust openings which permit bleeding both ends of the master valve alternately. This provides automatic reversal when electric current to the solenoid is shut off.

Model 6678 four-way, two-position valve is designed for side or base mounting, and is electric push-button, limit switch, timer, etc., controlled for operating double-acting air cylinders. Maintained contact of the control switch is required to direct air flow out lower cylinder port. Release of the switch interrupts electric current to solenoid and directs air flow out upper cylinder port and exhausts cylinder at lower port for reversal. *Logansport Machine Co.*

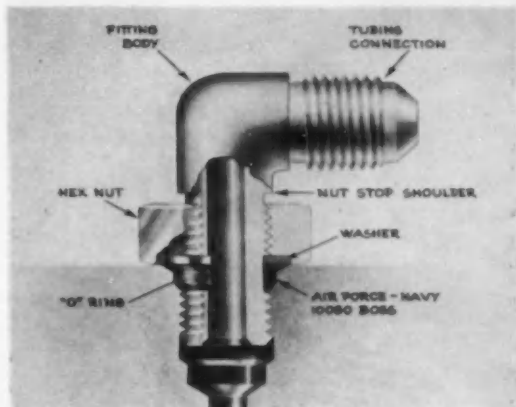
Circle 28 on postcard for more data

## Machine Tube Fittings

**I**N order to solve both the leakage problems and directionalizing problems often encountered with standard type fittings, a new tube fitting design called Ring Seal has been developed. It features an O ring and boss

from contact with the threads.

Fittings having straight, 45 deg elbow, 90 deg elbow, male outlet tee, and male run tee bodies are available in sizes to fit 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, and one in. tubing, as well as plugs



Tube fitting of new design fits tight in variety of materials, and can be machined as required.

combination to obtain a leak-proof seal. The fittings can be directionalized with ease in any material and require approximately the same installation space as previous designs, according to the maker. No special tools are required, and defective or worn threads have no influence on the efficiency of sealing.

Fittings incorporate an appropriately shaped body in either straight or angular form having a standard JIC 37 deg flare end for connection to the tubing. Upper and lower straight threads are located on the end of the fitting opposite the flare, with a hex nut turning on the upper threads. An O ring and washer embrace the body between the two thread sets. The upward travel of the O ring, washer, and the hex nut is limited by a special stop shoulder machined into the fitting body.

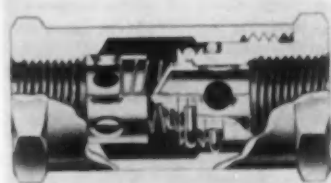
At installation, the nut is threaded up against the stop shoulder, and the entire fitting assembly screwed into the particular tapped opening until the O ring engages the boss provided. The boss is of standard Air Force-Navy 10050 design. The fitting is then turned in an additional 1-1/2 turns and directionalized by turning up to one more complete revolution. At this point, the nut and washer are turned down flush against the boss to extrude the O ring into the cavity between the boss and the fitting body. The position of the washer below the nut prevents damage to the O ring

and female adapters designed to fit the bosses employed with each of these sizes. *Monarch Machine Tool Co.*

Circle 29 on postcard for more data

## Check Valve

**A** NEWLY designed 3000-psi check valve, designated the 200-I series, features a heavier, more rugged construction. Location of the static O-ring body seal confines pressure to

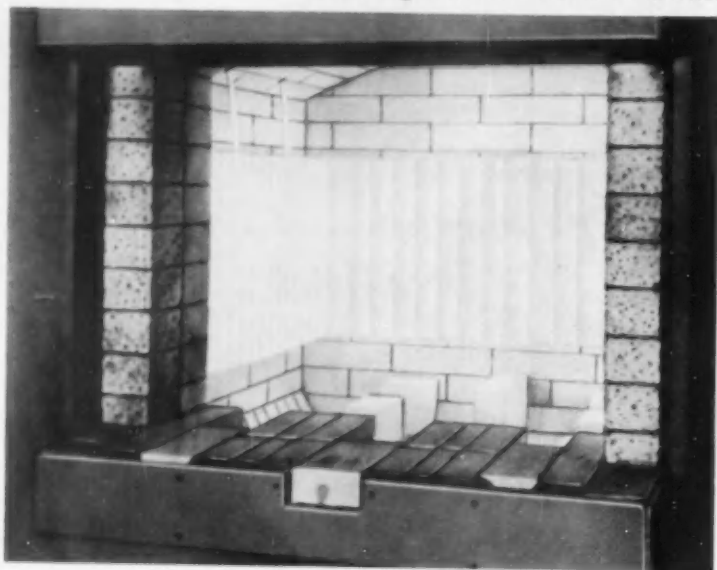


Circle Seal check valve.

the strongest part of the body. This design is claimed to give dead tight sealing and chatter-free operation. A cracking pressure of 0.5-1.0 psi combined with low pressure drop and leak-free reseating are said to make this new valve suitable for use in a wide variety of vacuum and low pressure gas systems as well as high pressure pneumatic or hydraulic circuits. Bodies of brass, aluminum, steel and stainless steel are available and range from 1/4 to two in. pipe size. *Circle Seal Precision Valves.*

Circle 30 on postcard for more data

## Heating Element Covers Furnace Wall



Lindberg Cortherm electric elements installed in a heat treating furnace.

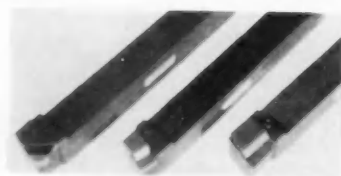
### Tool Holder

A NEWLY-DESIGNED tool holder with a carbide pad for throw-away-type carbide insert blanks makes it possible for cutting tools to operate with less overhang while providing greater rigidity. Chip interference as well as any projections under the shank are eliminated. A screw adjustment on top of the holder simplifies indexing the carbide cutting blank. Only a light tightening torque is required to hold the carbide insert blanks. The clamp also serves as a fixed chip breaker to provide uniform chip control. It can be furnished in several sizes.

Principle of the holder design is adaptable to special tools with cutting angles other than negative, to positive or neutral rakes or to multiple insert holders. Holder parts are completely interchangeable.

The new holder will be produced in five basic styles to accommodate all machining operations. Style A, for internal boring and chamfering, will also include two modified types to handle both triangular and round carbide inserts. Style B for internal facing, turning and chamfering will handle 30-deg triangular and 15-deg square inserts. Style G is an offset type to handle triangular inserts for facing. Style F is for parallel turn-

ing, straddle and perpendicular facing and recessing. It is offered in two types using both triangular and square inserts. Style D, which in-



Tool holders for carbide inserts

cludes a 30-deg lead angle, is for contour turning and lead angle cutting. Carboly Dept., General Electric Co.

Circle 31 on postcard for more data

### Neoprene Solvent

POLYGLYCOL Ether 181 was found to be effective in removing neoprene compound from aircraft radomes in less than two hours. Formerly it took one man eight hours to apply, clean and scrape a radome. Ausul Chemical Co.

Circle 32 on postcard for more data

**AUTOMOTIVE INDUSTRIES  
KEEPS YOU INFORMED**

COROTHERM is an entirely new electric heating element for atmospheric heat treating furnaces. This element consists of corrugated sheets of nickel-chromium which practically cover the entire walls of the furnace. These sheets are hung from alloy hooks extending through the roof, making the installation and replacement extremely simple. No supports or hangers need be built into the walls.

The large size is necessary to accommodate amperages ten to twenty times greater than in the previous types of elements. The greater surface area results in lower surface temperatures and therefore longer element life. The voltage is so low that accidental contact with the elements when loading or unloading the furnace cannot be felt. This is also true of outside electrical connections which need not be insulated. The secondary of the transformers is a single turn of very heavy aluminum buss bar, which connects directly to the elements.

In forced convection furnaces where high temperature fans force the hot gases through the charge being heated, the elements act as a direction baffle, heating the gases at the same time. In very large furnaces, elements are not only hung adjacent to the walls but can be suspended into the heating chamber itself. No retort is needed in pit-type furnaces.

It is anticipated that the new element will bring electric furnaces in competition again with fuel furnaces in the field of carburizing and carbonitriding. Lindberg Engineering Co.

Circle 33 on postcard for more data

### Brake-Motor

A SPECIAL brake-motor provides short span power (five-minutes-on-and-five-minutes-off). Its dimensions are 8% in. O.D. by 7% in. overall length. Starting torques are up to 500 per cent of running torque. The brake features so-called doughnut design and permits the extension of the shaft for a dual power-take-off. These motors are polyphase, totally enclosed, non-ventilated, flange mounted in any position. Motors are available in ratings of 1/3, 1 1/2 hp, brakes from 1/2 through 25 ft-lb, one minute through 10 minute intermittent duty. Reuland Electric Co.

Circle 34 on postcard for more data

## Hole Gages

**A**DJUSTABLE dial hole gages feature a new method for centralization of the gage in the hole. Careful alignment of the 1250P series gage laterally is unnecessary in order to obtain correct measurement of the hole diameter. The gage can be accurately set without master rings if desired. The centralizing device is so precisely concentric with the gaging contacts that the gage can be set directly to the flat surfaces of the gage blocks, and applied to the radiused surface of a hole with no significant error. Transfer accuracy in this case is said to be better than 50 millionths of an inch.

Features to reduce wear and lengthen the time of accuracy include large contact surface of the centralizer, jewel bearings which support components of the gage head, and tungsten carbide gaging contacts. Four gages in this series cover all requirements for checking hole diameters between  $\frac{1}{2}$  and eight in., with the maximum size for each gage being twice its minimum. Federal Products Corp.

Circle 35 on postcard for more data

## Automatic Sizer

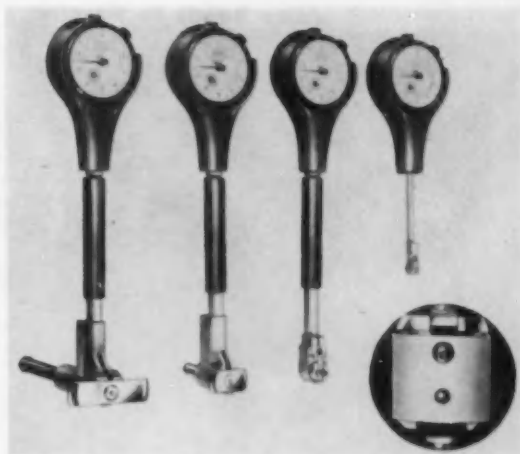
**G**AGING and sorting a variety of parts into as many as five specific size categories plus oversize and undersize, at speed of more than 3000 parts per hour, is possible with a new automatic unit.

This unit, known as the Autosort model 101, handles parts up to three in. long and  $\frac{3}{4}$  in. OD, and can be arranged for checking length, thickness, OD, or any other external measurement. It can be furnished with any size range desired from 0.0002 to



Cleveland Autosort model 101

Dial hole gages by Federal



0.010 in., and for sorting by increments as small as 0.000050 in.

The parts to be measured are fed from a hopper by motor-driven fingers and are placed, one at a time, on an anvil beneath a Par-Ac gage head. A voltage produced by the gage head goes through an amplifier to three contact meters; and the meter hands are thus positioned according to the size of the part being measured. The meter hands make contact with the preset contact arms to actuate a relay system; and this energizes a sorting-gate solenoid that corresponds to the size group of the part. The part is then pushed off the anvil by the feeding-in of the next part, and drops vertically until it is deflected by the gate into a corresponding discharge chute. Cleveland Instrument Co.

Circle 36 on postcard for more data

## Data Recorders

**T**O obtain flight test data, a new series of airborne magnetic tape recorders has been introduced. Known as Series 800 equipment, the lightweight, shock-resistant recorders are available in versions to record two channels on  $\frac{1}{4}$ -in. tape to models for recording 28 tracks on two-in. tape.

Plug-in amplifiers permit recording, on any channel, of pulse-width modulation data, high accuracy transient information by means of wide-deviation frequency modulation or wide band direct data including mixed RDB/FM subcarriers. These various recording techniques can be used in any combination by the simple expedient of plugging in the correct type amplifier.

Typical of the new equipment is

model 807 which records seven information tracks on tape  $\frac{1}{2}$  in. wide. It consists of five cable-connected units, a tape transport mechanism, the record electronics, the electronics power supply, the tape transport power supply and a remote control unit. The tape drive employs a closed loop design to reduce flutter and wow to a minimum. Any of four speeds are selected by shifting a belt-and-pulley drive system. Transport are available with speeds of 15,  $7\frac{1}{2}$ , 3% and 1% in. per second or 30, 15,  $7\frac{1}{2}$  and 3% in. per second. A housing providing space for seven plug-in record amplifiers contains the record electronics. Two types of amplifier are available, for recording information directly or in PWM form; or for information in FM form. The amplifiers are interchangeable so that any combination of the three basic recording techniques can be used. Approximately 45 channels of low frequency information can be recorded on each PWM track. One channel of transient information can be recorded on each FM channel.

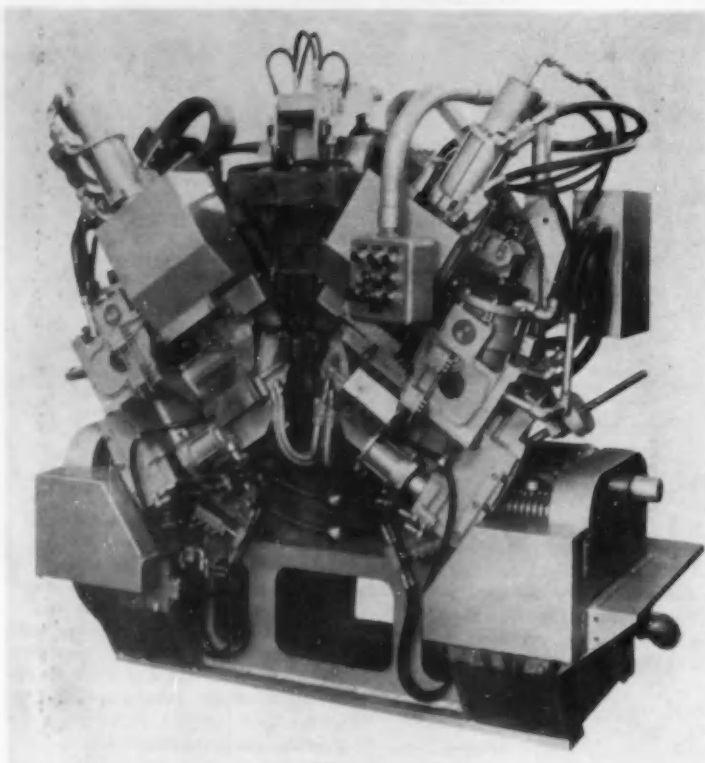
At a tape speed of 30 in. per second, frequency response of direct recording channels is  $\pm$  three db from 300 to 35,000 cps and of FM channels,  $\pm$  one db from 0 to 5000 cps. PWM channels will accept pulse widths from 60 to 1000 microseconds.

Wow and flutter are below 0.1 per cent rms. Average tape velocity is within 0.1 per cent of the specified tape speed. Signal-to-noise ratio at 30 ips is 35 db below 1 per cent distortion for direct recording channels and 40 db below the 1-v level for FM tracks. Ampex Corp.

Circle 37 on postcard for more data



## Joins Bands to Forging



The T-W double end welder.

**T**HE Double End Welder, a new development in resistance welding equipment, flash-butt rolled steel band stock to high strength forgings to make automatic transmission bands. It joins both ends at once, and the welds are of the same cross-section as the band, since resistance flash-butt welding produces a 100 per

cent efficient joint. No special preparation of the forging is necessary for making the welded joint.

After welding, the joints are broached free of flash, the forging is severed between its bosses and machined to complete the band. *Taylor-Winfield Corp.*

Circle 38 on postcard for more data

## Motor Brake

**A** SHORT mechanical motor brake is built into the motor frame and enclosed in the housing. It is claimed to save up to seven in. in length. This brake allows for quick opening and avoids sudden impact on stopping. Tension springs can be adjusted for rapid or slower stops. Four locking screws give any desired adjustment. Precise tolerances reportedly are not required with this new type brake. The assembly is provided with fans for temperature control. These new brake motors can be installed in any position and are especially designed for work requiring

frequent braking. They can also be inched and require a minimum of maintenance. *The Cleveland Electric Motor Co.*

Circle 39 on postcard for more data



Cleveland mechanical motor brake

## Aids Temperature Measurement

**O**RIGINALLY for test-cell use in the jet-engine and rocket-motor industries, where potentiometer-type strip chart recorders measure pressures, flow-rates, electrical and mechanical conditions, a device recently developed permits measuring temperatures with the same strip chart recorder, thus eliminating the necessity for using a separate pyrometer.

Prior to this innovation, when instruments without "cold-end" (reference junction) compensation were used with thermocouples, corrections for varying room temperatures had to be registered continuously. The device is called a thermo-electric constant-temperature reference junction. It holds a constant, predetermined temperature at the thermocouple circuit reference junction—regardless of variations in the ambient temperatures. Control is provided by a high-sensitivity thermostat operating a relay which meters electric power to a constant-temperature zone heater. This reference junction may be introduced at any point in the thermocouple circuit, regardless of the location of the measuring instruments or thermocouples.

A small, lightweight version of this junction unit can be furnished for installation in an aircraft wing section close to the engine pods. Thermocouples measuring engine temperatures can be connected to it through short thermocouple wire leads to the input . . . then output leads to millivoltmeter-type instruments can be of ordinary copper wire.

This reference junction may be used in ambient temperatures from -65 F to +300 F. Any standard thermocouple materials may be specified for connectors. Reference junction temperature is factory set at 25 F above the maximum ambient, and is maintained within  $\pm 1$  F, or even within narrower limits, if necessary. *Thermo Electric Co., Inc.*

Circle 40 on postcard for more data

## Rubber Bond

**T**Y-PLY BC is a cover-cement designed for vulcanized bonding of butyl compounds to metals, to each other and to other types of rubbers. It is a black liquid containing dispersed solids, supplied at brushing viscosity. *Marbon Chemical Div., Borg-Warner Corp.*

Circle 41 on postcard for more data

## Cam Feed Units

**C**AM units up to five hp capacity, furnished in four sizes, to drill ream, tap, and mill is available. Each unit is self-contained. All power is derived through a single motor with no air or hydraulic involvements. Units can be mounted in any position and any number of units can be used. Standard equipment with each unit includes four standard purpose cams and complete sets of cycle change gears. Feeds and speeds are of infinite variation, and charts are provided to aid in selection of proper speeds.

Four drives are furnished: Cone pulley, direct motor, stub-shaft, or gear box. Oiling systems are self-contained. With four sizes, drill size range is from  $\frac{1}{8}$  through two in. The cycle time ranges from two seconds through 410 seconds. The stroke range is from 2% through five in. Spindle speeds range from 300 through 4032 rpm. *Zagar Tool, Inc.*

Circle 42 on postcard for more data

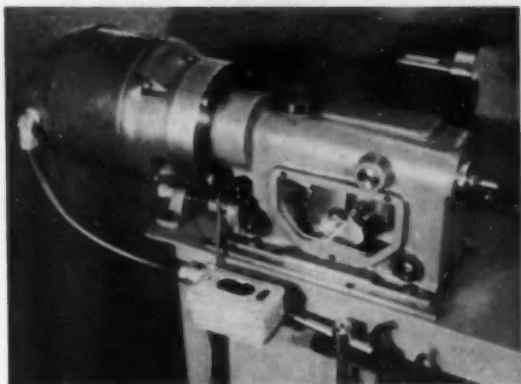
## Metallizing Process

**V**ACUUM metallizing units for the continuous roll metallizing of plastic film and sheeting such as Mylar, acetate, cellophane, and butyrate were disclosed recently. Previous continuous roll metallizing of plastic has been done in a dual-chamber set-up with the plastic material outgassed in one vacuum chamber and then transferred to a second chamber to receive the thin coating of metal deposited by evaporation.

The new continuous roll metallizing units have only a single vacuum chamber and need only a single vacuum pumping system. They can coat plastic material in widths of 6, 24, 36, 48, 54 or 60 in. at speeds up to 500 fpm. Rolls up to 24 in. in diameter can be accommodated in the units, and material ranging in thickness from 0.0005 in. up to 0.0020 in. can be coated.

The units incorporate a device for continuously supplying the pure metal to be deposited. An observation-port set into the cover of the unit, plus a fluorescent light source placed behind the coated film, allows the operator to check the uniformity and quality of the coating continuously, during the deposition process, and to adjust the speed of travel of the plastic film through the evaporation chamber so as to obtain the desired thickness of metal deposit. Air-

Light weight cam feed drilling and tapping units are adaptable to a wide range of operations.



actuated poppet valves, push-button controlled from the front panel, simplify the operation of the units. *F. J. Stokes Machine Co.*

Circle 43 on postcard for more data

## Die Handler

**A** NEW die-handling industrial truck that can load and unload dies from either side or the end of its platform was introduced recently. The unit's side-loading mechanism is of the motorized pin type. Dies are loaded and unloaded off the end of the truck's platform by means of two powered winches. Winch units can be operated individually or simultaneously from push-button control stations mounted on each side of the truck and at the operator's position, permitting exact placement of dies in the presses.

Two retractable extension arms are located on each side of the platform, to bridge the space between the truck and press during sideloading operations. Drums and sheaves used to load and handle dies are also re-

tractable, giving the unit a total width of 50 in. Lifting range of the unit is 65 in. *Automatic Transportation Co.*

Circle 44 on postcard for more data

## Index Table

**H**EAVY duty positive locking index tables recently announced are power or hand operated. Base and top plate are Mechanite castings with hardened ball races. The table turns on a hardened steel thrust ring. Sizes from 18 to 48 in. in diameter are made with single or double shot pin. Pin and the locking device are operated by one handle. Concentricity is provided by cam action. *Sesco, Inc.*

Circle 45 on postcard for more data

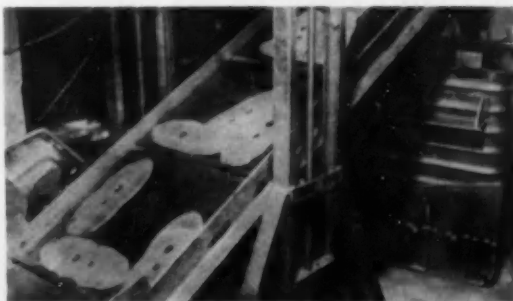
## Air Hose

**S**PECIALAIRE is a new air hose made in four sizes— $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  in. ID—to operate at 200 psi. Two braids of rayon reinforce the hose. The tube is compounded to resist oil in air lines. *Thermoid Co.*

Circle 46 on postcard for more data

## Cleated Conveyor Belt

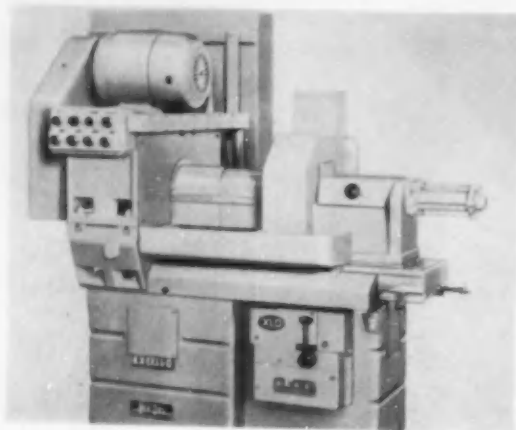
Designed to carry loads up steep inclines where regular flat-topped belts would be ineffective, a cleated belt has been introduced. It is used to transport materials up a grade of 30 percent or more where a non-ridged conveyor belt would allow slippage. Already in production, the belting is available in a range of plies, cover thicknesses, widths and rubber compounds to meet practically all customer specifications. Rubber cleats can be obtained in heights of  $\frac{3}{8}$ ,  $\frac{1}{2}$ , 1 and  $1\frac{1}{2}$  in. (*Goodyear Tire & Rubber Co.*)



Circle 47 on postcard for more data

## Deep Hole Drilling Process

A METHOD of drilling deep holes accurately, from the solid, known as Bor-Drill, holds precision limits for straightness, roundness, finish and diameter. Cored holes in castings can be finish-machined in one operation.



Example of deep hole drilling by the Bor-Drill process, on odd-shaped workpiece.

The process is a direct descendant of gun drilling. The part to be drilled is clamped to a simple fixture and held stationary. Coolant is supplied under high pressure through the gun type drill. The coolant washes the chips out through the single flute in addition to dissipating heat.

Precision boring machines are especially suitable for the process, which is also adaptable to way-type precision boring machines and special machines. Smooth table movement, versatile machine cycles and work feeds

are requisites for producing deep, clean, accurate holes. Two or more parts can be drilled simultaneously with multiple spindle arrangements. Two or more parallel holes can be completed in one part or double end

boring machines can be used.

The firm has designed many machines especially for Bor-Drill applications. One example produces a finished hole, 6 3/4 in. long with a 1/2 in. diameter in cast-iron distributor bases. From the solid, the hole is Bor-Drilled straight and round within 0.0005 in. and the diameter is also held within 0.0005 in. Finish roughness does not exceed 15 microinches rms, and the machining time per piece is 30 seconds. *Ex-Cell-O Corp.*

Circle 48 on postcard for more data

## Cleans Gondolas

METAL gondolas, used to transport castings and large rough metal parts, are cleaned automatically in a new machine. The machine eliminates all hand labor costs and speeds cleaning of the gondolas. The fork-lift truck operator transports a gondola to the machine, placing it on the receiving fixture. He then presses the machine "start" button. The balance of the operation is automatic. He may remove a previously cleaned gondola from a second fixture of the machine. Production is 12 units per hour, up to 60 by 44 by 32 in. in size.

The dirty gondola is automatically turned up-side-down, permitting loose debris to empty into a refuse container. The gondola is then carried into the machine and brought to a

stop in the cleaning section. During an automatically timed cycle, high pressure spray nozzles wash the interior and exterior of the gondola, with cleaning solution. Accumulated debris is loosened and flushed away. It is automatically returned to its upright position on the loading fixture. *Cincinnati Cleaning & Flushing Machinery Co.*

Circle 49 on postcard for more data

## Lattice Mountings

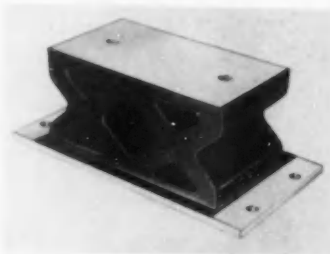
BONDED-RUBBER lattice mountings are designed to provide a high degree of vibration and noise isolation, particularly in the low-frequency, high-amplitude range. A complete line of this new mounting has been developed and is now being pro-

duced with capacities ranging from 250 to 3000 lb and static deflections from 1/4 to 1 1/2 in.

Resembling a sandwich in construction, the mountings feature a latticed rubber section which is bonded to horizontal steel plates at the top and bottom. The patented lattice design permits the shock load to be carried by the rubber in shear, providing a high degree of horizontal stability. Lubrication is never required. Noise transmission is eliminated. The damping characteristic of the elastomer stops excursion of machinery when passing through resonance in starting or stopping.

The large deflection of lattice mountings make them particularly effective against low-frequency disturbances and/or where extremely high degrees of isolation are required. Where the operating speed of the machine to be mounted is extremely low, these mountings may be installed in series. *Lord Manufacturing Co.*

Circle 50 on postcard for more data



Lord lattice machine mounting

## Aluminum Deoxidizer

PROCESS 822 and its companion process 822C are patented products for preparing aluminum for spotwelding. The product also removes anodized coatings. Process 822 is a liquid, miscible in water, for the removal of oxides and scale from aluminum prior to spotwelding. It is used by immersion in type 316 stainless steel, tygon, rubber, or glass lined equipment. Process 822C makes it possible to deoxidize surfaces of parts to be welded without immersion treatment. With 822 no critical time or temperature control is required. Aluminum prepared for spotwelding with 822 shows very low micro-ohm resistance. There are no volatile nor flammable solvents, no toxic nor corrosive vapors. *Kelite Corp.*

Circle 51 on postcard for more data

## Lubricator

**T**YPE S air line lubricators permit quick, easy installation in tight quarters. It is designed to meet JIC requirements of locking enclosure mounting of pneumatic devices. The unit consists of a head-bowl assembly equipped with a separable, rectangular steel venturi block. The block can be unscrewed by hand, and roughed into an intricate compartment circuit in the same manner as any common pipe fitting, and within the same clearances.

A sintered bronze lubricator wick projects upward from the bowl into the chamber of the venturi block. The amount of projection governs the oil-feed rate and is pre-set. One head bowl assembly fits all sizes of venturi blocks.

The lubricators are made in a range of sizes, from 1/4 in. NPTF, rated at 20 cfm free air, to 3/4 in., with a 120 rating. *Master Pneumatic, Inc.*

Circle 52 on postcard for more data



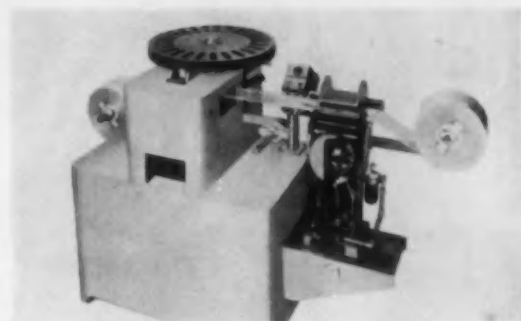
Installing a Type S lubricator in a restricted space

## Gage Tester

**P**ERIODIC checking of pressure gages is facilitated with improved models of dead weight pressure gage testers. The compact units are guaranteed to be accurate within 1/10 of one per cent of the indicated reading. The complete unit with accessories is portable and contained in a metal case. A special container for carrying the weights is also provided. Three models are available—up to 3000 psi., from 4000 to 6000 psi., and up to 10,000 psi. *Amthor Testing Instrument Co.*

Circle 53 on postcard for more data

Pak-Rapid packager-printer.



## Prints, Packages

**A** TRADEMARK, product description, control number, etc., can be imprinted on packages simultaneously formed, filled and heat sealed. Equipped with a Markem model 70AI printing unit, the machine automatically prints the flexible two-dimensional packages, formed around the product from roll stock at rates up to 3600 per hour. Vertical feeding principle permits packaging single items or assortments. A wide variety of both uniform and irregular shaped

items can be handled without change or adjustment of feed.

Positive registration of package imprint is assured by printing head cycling through a Micro Switch activated by the machine. Imprint flexibility is accomplished by easily changed Markem printing elements, precision made in a wide range of styles and sizes. Other advantages include variable speed drive, automatically controlled sealing pressure and temperature, and automatic safety features. *Pak-Rapid, Inc.*

Circle 54 on postcard for more data

## Air Pump

**A**N integral motor-pump unit, model RG-10470 is compact and readily adaptable to a process or a machine requiring automatic pressure to 20 psi gage. A common shaft transmits motor power to the pump rotor and sliding blades. No seals or shaft packings are used. Self-lubricating thrust plates and blades of carbon-graphite composition take up wear automatically. Oil-free pump impeller parts are assembled on the end of the three ball bearing armature shaft.

Pump displacement is 0.304 cu in. per revolution. Rated capacity of the pump is 550 cfm free air delivery at 20 psi discharge pressure with

standard sea level inlet conditions. Dehydrators containing adsorbent desiccant are available as extra equipment. When used, air is dried at the pump inlet, thus discharge is both moisture and oil free. The motor is 1/6 hp at 3450 rpm. *Lear, Inc., Lear-Romec Div.*

Circle 55 on postcard for more data

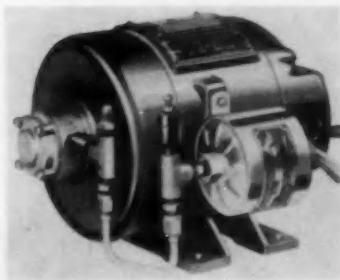
## Tracer Setup

**A** UNIQUE combination of hydraulic tracer turning and auxiliary tooling on a rear slide enables automotive stem pinions to be completely machined in a single tracer lathe. The part, an SAE 4620 forging, is machined at a spindle speed of 1046 rpm and 0.027 in. feed. Turning is done dry or with coolant.

In order to do the job in a single chucking, including turning the head, carbide driving inserts are used on the spindle and eliminate the need for any chucking arrangement that would interfere with taking this cut.

Nearly two lb of metal are removed. The rear carriage with its special tooling turns the thread diameter and the head while the tracer turns the stem. *Hydra-Feed Machine Tool Co.*

Circle 56 on postcard for more data

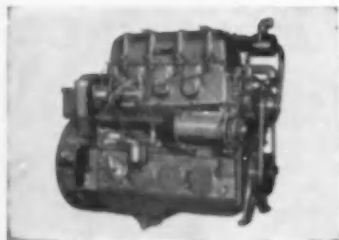


Lear integral motor-pump for industrial use



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**how it kicked some old ideas in the teeth**



Series C-18 P&H automotive Diesels — now with single, fully self-contained fuel pump; perfect timing and balance for each cylinder. 30 to 280 horsepower, two-cycle, 2, 3, 4, 6-cylinder models, speeds up to 1800 r.p.m. Also stationary, marine and diesel-generating sets.

Old idea: that diesels had just about reached the limit of efficiency. Then came the P&H — and a new high in horsepower per pound of engine weight.

Old idea: that diesels were costly by nature, \$20.00 a horsepower and more. Then P&H drove the price down to a record low — \$16.32.

Old idea: that horsepower ratings must always be tricky. P&H chose a new rating — horsepower measured right at the driveshaft, where every bit of it works for you.

The best idea, of course, is to learn *all* the ways this engine gives you more for your money. We'll be glad to send you the full story; write P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Illinois.

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## FREE LITERATURE

### Plastic Products 1

A four-page bulletin on its line of plastic hose and hose assemblies, sheets and molded products has been published. Known as "compar," the plastic is a modified polyvinyl alcohol resin processed into a tough, strong and flexible elastomeric material unaffected by all water insoluble liquids, including those which attack solvent resistant synthetic rubber formulations. *Resistoflex Corp.*

### Gear Shaper 2

Models 18136 and 18206, additions to the Shear-Speed gear shaper line, have been covered in bulletin SS-55, eight pages. These models have the capacity to shape gears up to 20-in. diameter with six-in. face width and diametral pitch of 2 at a high rate. *Michigan Tool Co.*

### Extruded Steel 3

Typical sections of hot extruded and cold drawn carbon steel are shown in a new booklet just published by *Jones & Laughlin Steel Corp.*

### Temperature Control 4

Data Sheet 5.1-4 describes the application of instrumentation to various types of plating tanks. Schematic diagrams of typical installations describe the use of electric and pneumatic temperature control systems, and of recording, indicating and non-indicating instruments. *Minneapolis-Honeywell Regulator Co., Industrial Div.*

### Turret Chuck 5

A new 20-page catalog covering the eight-in. and 12-in. Super-Spacers and their accessories has just been published. This device is a chuck and index plate mounted on a turret, for attachment to table-type machines. *Hartford Special Machinery Co.*

### Rotary Milling 6

A 40-page illustrated brochure is now ready on continuous rotary milling machines. It explores their applications to various types of jobs, and points out their economy on short run work. It also shows the use of automatic self-opening and closing fixtures. *Consolidated Machine Tool Co.*

### Valve Failures 7

Diagnosing valve failures is the subject of Vol. 16, No. 3 of the Eaton Engineering Forum. *Eaton Manufacturing Co.*

### Heavy Presses 8

A description of its part in the Air Force heavy press program, and details of its equipment, are given in a folder being distributed by *Wyman-Gordon Co.*

### Job Lapping 9

A brochure picturing and describing its job lapping department is available from *Norton Co.*

VOID After November 15, 1955

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**Shielded Welding 10**

Aircomatic inert-gas-shielded metal arc welding equipment, manual and automatic units along with accessory apparatus and welding wire, are included in a 16-page illustrated booklet. *Air Reduction Sales Co.*

**Machine Mounts 11**

Catalog K3A giving data on stopping vibration, shock and noise transmission by using steel spring machinery mountings has been published by *Korfund Co.*

**Speed Variator 12**

The Speed Variator line of type K tilting-ball-type drives in nine standard sizes with constant horsepower input ratings has been supplemented by the addition of nine type KL models for constant torque applications. Bulletin K-200. *Cleveland Worm & Gear Co.*

**Teflon Stock 13**

A catalog on Teflon stock and custom fabrication service includes tables and descriptive matter on the chemical, electrical thermal and mechanical properties of duPont Teflon sheets, tape, molded cylinders and bars, extruded tubing and rods, electrical spaghetti, beading and extruded shapes. Catalog 300. *United States Gasket Co.*

**Nylon Compound 14**

Molding characteristics and physical properties of Plaskon Nylon 8200 are presented in a new booklet by Barrett Div., *Allied Chemical & Dye Corp.*

**Heat Fixtures 16**

A house publication features an article on "Efficient Fixturing" for increase of furnace versatility and economy. Photos illustrate examples of fixtures and trays. The eight-page issue contains also "Complete Heat Treat Plants with Standard Equipment" and other editorials pertaining to cost-saving applications of modern furnaces. *Heat Treat Review*, Vol. 6, No. 1. *Surface Combustion Corp.*

**Zinc Data 17**

"How Zinc Controls Corrosion," a new 32-page illustrated booklet has just been published by the *American Zinc Institute*

**Hoist Chart 18**

A Hoist Classification Rating Chart, Issue No. 2, is representative of all of the major hydraulic hoist and steel dump body manufacturers, members of and comprising an Industry Division within the *Truck Body and Equipment Association, Inc.*

**Clad Metals 19**

Technical Advisor No. 30, just issued, features some of the important uses of aluminum in composite metals. Applications of growing importance discussed include a composite employing aluminum for 80 per cent of its thickness, copper for the remaining; and an aluminum-silver combination. *Reynolds Metals Co.*

**Drill Presses 20**

New 16-in. Royal single and multiple-spindle drill presses are announced in catalog D-134. The line has a capacity of ½-in. in cast iron, five or 17 spindle speeds, choice of two motors. *Cincinnati Lathe and Tool Co.*

**Program Control 21**

Bulletin 1130, Program Control of Process Variables, describes the methods and advantages of employing automatic, time-conditions control for many industrial processes and tests. A convenient selection chart aids in choosing the right instruments for any program control application. Write on company letterhead to *Industrial Div., Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa.*

**Production Units 15**

A variety of standard units for machining, control, work transfer, chip disposal and other functions in drilling and similar operations are illustrated in catalog 150-D, 32 pages, offered by *Barnes Drill Co.*

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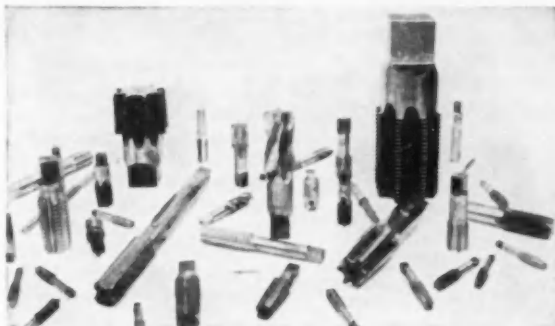
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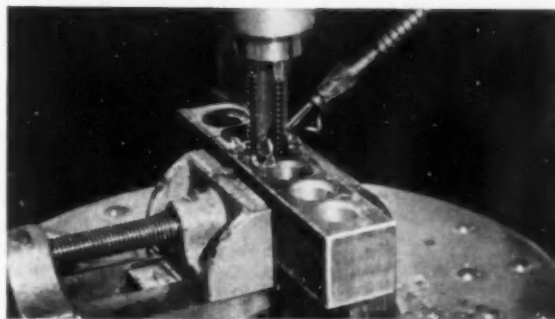
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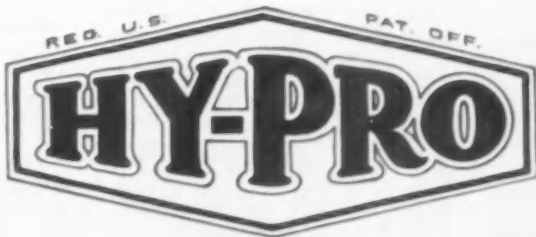
**ANALYSIS AND RECOMMENDATIONS** by Hy-Pro's specialists have saved time and cut costs repeatedly for Hy-Pro's customers.

**...to help cut time  
from your schedule**

Hy-Pro concentrates its operation on the production of taps. Every effort is made toward the improvement of tap efficiency and cutting tapping costs.

Time and time again, manufacturers have saved man-hours in their operations through the help of Hy-Pro's tap experts. This repeated success has gained them recognition in business as "*The Tap Specialists*".

It will pay you to contact your local Hy-Pro distributor today or to call the company direct. Hy-Pro offers you the exclusive benefit of specialized tap production in its complete line of high-quality taps.



**HY-PRO TOOL CO., NEW BEDFORD, MASS., U. S. A.**

**DISTRIBUTORS IN ALL LEADING CITIES**

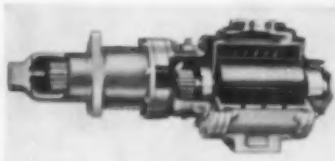
**ADDITIONAL WAREHOUSES:** 6046 College Ave. 10428 W. McNichols Rd. 11232 Lawler St. (Worth) 109 Edison Pl.  
OAKLAND 18, CALIF. DETROIT 21, MICH. CHICAGO, ILL. NEWARK 5, N. J.  
Piedmont 5-4337 University 4-1077 Garden 4-0217 Market 2-4318

# NEW

# PRODUCTS

## AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 93



### Air Starting Motors

Fast starting of heavy duty gasoline and Diesel engines is the purpose of a new air starting motor. The Startaire motors are the rotary multi-vane type, with a friction clutch and housing. They are said to be interchangeable with electric units. Two sizes are being built, model 15 for engines up to 1100 cu in. and model 30 for larger engines. *Bendix-Westinghouse Automotive Air Brake Co.*

Circle 86 on postcard for more data

### Non-Ferrous Rollpin

Beryllium copper Rollpins have been developed for applications requiring non-magnetic qualities, good electrical conductivity and high resistance to corrosion. The device is an inexpensive replacement for taper pins, straight solid pins and set screws. It is also successfully used as a rivet, dowel, hinge pin, cotter pin or stop pin. The copper Rollpin is a slotted chamfered tubular spring pin, heat treated to achieve maximum strength. Each pin has a controlled diameter slightly larger than the fractional drill size hole into which it is to be inserted. Compressed as it is driven into the hole, it provides a continuous spring pressure against the hole walls. *Elastic Stop Nut Corp. of America.*

Circle 87 on postcard for more data

### Heater Hose

Neoprene car heater hose has been put in production by the Automotive Replacement Div. A specially compounded tie gum section locks the tough, outer covering to the neoprene inner tube without restricting flexibility. The hose is reinforced by heavy knit Cordura fiber. *Thermoid Co.*

Circle 88 on postcard for more data

### Unique Piston

A steel-lined top ring groove in a new piston reportedly materially reduces top ring land wear and rounding. The piston has steel on both top and bottom of the top groove. The ring is positioned so that when the



grooves are machined, the top ring groove is lined with steel and has piers of aluminum for ring cooling. Two steel rings are welded together and placed in the mold before pouring and are Intra-Cast into the piston. The new Grooves will be made available first on the Conformatic line of pistons. *Sterling Aluminum Products Inc.*

Circle 89 on postcard for more data

### Plastic Sandwich

A strong, lightweight, insulated plastic sandwich construction panel with a wide variety of potential industrial uses has been developed by Haskelite Manufacturing Corp. The panel, called Hasko-Struct, is composed of a Styrofoam expanded polystyrene core with a facing of glass fiber cloth reinforced polyester sheet. In addition to lightweight, structural strength and thermal-insulating properties, the panel is also moisture-proof and corrosion-resistant. The core with a density of two lb per cu ft or higher is covered with the polyester reinforced glass fiber cloth in 0.018 and 0.032-in. thickness. The standard sandwiches are 1, 2, 3, 4 or 6-in. in thickness. Special sizes run as high as 18 in. Standard width is 48 in. with lengths 96, 120 or 144 in. *Dow Chemical Co.*

Circle 90 on postcard for more data



### Flexible Shaft

Heart of an extra-heavy duty flexible shaft is a new heavy duty core 1 1/4 in. in diameter. This core is made up of layers of tightly wound high-grade music wire. The new shaft can transmit up to 1650 lb-in. of torque at 440 rpm. The casing is lined with oil tempered spring steel, reinforced with wire braid, covered with oil resistant neoprene impregnated fabric and an abrasion resistant rubber jacket. The casing serves as the bearing surface for the core and also retains the lubricant. Extra reinforcement can be put on one end as shown.

The shaft is provided with steel-backed bronze sleeve bearings at each end which allows the core to float inside the casing. Couplings of various bores are available for connecting up at each end. Also, on applications where there is apt to be a change in length of the drive, square slip joints, 18 in. long, are available for connection at one end. These are used on tractor-trailers to take care of the change in length when the tractor-trailer jackknives. *Stow Manufacturing Co.*

Circle 91 on postcard for more data

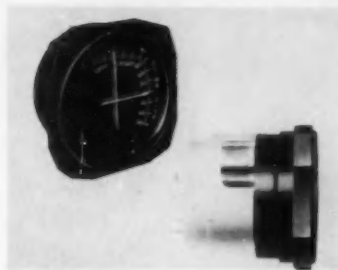
### Locking Bushing

A self-locking, vibration proof bushing is designed for relatively soft castings, forgings and extrusions such as aluminum alloy, magnesium, mild steel and some plastics. The ESNA Type 2424 bushing is available in two internally self-locking designs depending upon temperature requirements, type N2424 with the red nylon locking collar for temperatures up to 250 F and the type LH2424 all metal locking device for temperatures up to 550 F. Both locking elements provide locking torque protection and reuse characteristics as required in AN-N-5b and AN-N-10a respectively. *Elastic Stop Nut Corp. of America.*

Circle 92 on postcard for more data

## Coaxial Instruments

A new AN-type, multi-element aircraft instrument, utilizing coaxial mechanisms, has greater durability and performance stability than many larger and heavier existing instru-



ments. Designated AN3C-2E, the new two-element instruments meet the requirements of AN standard AND 10401, recently superseded by MS 33550, for 2 1/4 in. dial instruments. They are also available with one, three or four elements for such applications as ammeters, voltmeters, temperature indicators and radio navigational instruments. Two fasteners hold the rigid, interlocked coaxial assembly together. Precise alignment of parts is aided by machining all critical dimensions from a common center (bearing axis). *Marion Electrical Instrument Co.*

Circle 93 on postcard for more data

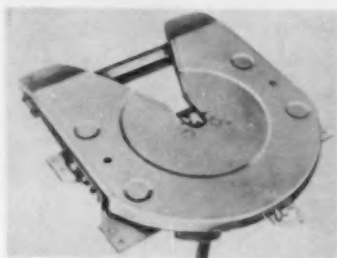
## Plastic Clamp

A one-piece nylon clamp for holding wires, cable, and tubes has been introduced. This fastener is non-chafing, non-corrosive, and self-insulating, lighter than aluminum and withstands a wide temperature range. In addition, the curved-base design and snap-in feature provide a tight rattle-free application. A variety of wire and tube sizes plus a range of panel thicknesses can be accommodated with this fastener. *Shakeproof, Div. of Illinois Tool Works.*

Circle 94 on postcard for more data

## Fifth Wheel

Just introduced is a 38-in. pressed steel, low-silhouette coupler capable of handling up to 30,000-lb king pin loads. This light weight unit achieves a great deal of its strength and stiffness from its structural design rather than in the use of heavy material. There is a heavy-duty top plate flanged around the outer edges for stiffness. Bearing surfaces throughout are large for long life and the operating mechanism is relieved of impact stresses by having the heavy



supporting structure of the unit receive forces involved in coupling. A striker plate transmits the king pin force to the structural parts, relieving the cam hooks from impact.

There is a wide spread king pin entrance angle permitting more latitude in the coupling approach. A cross brace stabilizes the top plate when the king pin enters at an angle. The spring mounts, each having 25 sq in. bearing area, reduce stress and wear to a minimum. The spring mounts are of chrome steel. Stainless steel is employed for the lock plunger spring. The complete locking mechanism can be removed by taking out only two bolts after which the mechanism can be removed through the front. It is located between the striker and top plates which gives it double protection while at the same time increasing its overall strength and rigidity to overcome any tendency to twist or warp. This unit is nearly 60 per cent lighter than the former pressed steel design. *Fruehauf Trailer Co.*

Circle 95 on postcard for more data

## Alloy Steels

Corrosion resistant precipitation hardenable stainless steel alloys are designed to meet the following needs:

PH55A—A high strength and high hardness alloy with fair ductility, for erosion and abrasion resistance or for stressed parts in corrosive applications.

PH55B—A ductile high strength alloy of medium hardness, for shock resistance and high stresses in corrosive applications.

PH55C—A very high hardness alloy of low ductility for non-stressed, corrosion resisting parts.

PH20—A gall resistant alloy with superior corrosion resistance.

All three alloys in the PH55 series are variations of the 19 per cent chromium, 9 per cent nickel analysis. By introducing and varying molybdenum, copper and silicon and controlling the carbon below 0.08 per cent and the manganese below 1 per cent, variations in hardness and ductility

are achieved. The corrosion resistance of these three alloys equals or surpasses that of type 316 stainless; average Brinell hardness for PH55A, B and C is 341, 293, and 415 respectively. Type PH20 is a precipitation hardenable version of the 20 per cent chromium, 29 per cent nickel type 20 alloy. Average Brinell hardness of 229 can be achieved with this alloy. *Cooper Alloy Corp.*

Circle 96 on postcard for more data

## Snap Switch

A highly precise sensitive snap switch is made for applications requiring extremely small movement differential with high resistance to

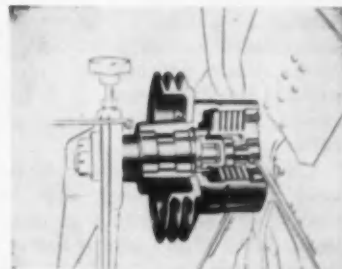


shock and vibration. The sine curved switching element withstands vibration from zero to 500 cycles at 10 G's while continuously loaded to within 0.0002 in. of the actuation point. *Spencer Thermostat Div., Metals & Controls Corp.*

Circle 97 on postcard for more data

## Air Fan Drive

The Thermonic air operated fan drive system is designed to maintain engine coolant temperature at the most efficient level. A thermal element in a control valve causes the



engine fan to engage or disengage as required. The fan on a truck engine would be disengaged most of the time, providing more engine horsepower to the drive line or greater fuel economy. On buses it stabilizes engine cooling for better heating system efficiency. *Bendix-Westinghouse Automotive Air Brake Co.*

Circle 98 on postcard for more data



**C**ONVERSION of four lift trucks to propane (LP-gas) has virtually eliminated a serious fumes problem at Dole Valve Co., Morton Grove, Ill., besides saving the firm about \$700 a year on fuel and maintenance costs.

Fumes were so bad when the trucks operated on gasoline that the vehicles had to be warmed up on an outside shipping platform, according to R. C. Mers, production control manager. Each truck wasted at least 15 minutes every day before it was ready to go to work.

The firm's plant has a comparatively low ceiling—15-20 ft high. There are closely-spaced banks of automatic and hand screw machines and punch presses only a few feet apart, and 1600 ft of conveyorized assembly lines manned by about 200 workers.

Since the four trucks were converted about a year and a half ago, there have been no complaints of exhaust fumes. Propane gives off a thin cloud of exhaust fumes that contains only a minute percentage of carbon monoxide.

Propane's biggest economy comes from the fact that it sells for about 30 per cent less per gallon than gasoline. Dole pays 21 cents, compared to 30 for gasoline. Each truck operates about 30 hours a week, and consumes about a gallon of propane or gasoline per hour. Mers figures that the annual saving comes to about \$600.

Since the switch to propane, Dole's lift trucks have been operating about twice as long between oil changes.

Maintenance mechanics have to flush the crankcases of the vehicles approximately every 1000 hours, compared to every 500 before. With half as many changes, annual cost of oil has dropped about \$50, Mers reported.

Minor repairs also have been substantially reduced since the switch. Spark plugs, for example, which used to give out after six months, now last twice as long. Carburetors formerly had to be cleaned at about the same time; now they last a year also.

Conversion of the four trucks to propane cost about \$800—\$160 for parts, \$40 for labor per truck. The work was done by an outside firm.

Each lift truck was equipped with an eight gallon propane tank, a fuel line made from  $\frac{3}{8}$  in. copper tubing, an electric solenoid mounted on the engine firewall, and a heat regulator. A new carburetor also had to be installed. Essentially, this is the butterfly

(Turn to page 146, please)



A chore performed by Dole Valve's propane-powered lift trucks is the stacking of material in metal racks to heights of 12 ft.

## SWITCH TO PROPANE *Cuts Costs of Lift Truck Operation*



Tanks are easily uncoupled when empty, by closing fuel control valve, disconnecting mounting strap, and uncoupling fuel line. Replacing new tank takes less than two minutes.



# 336,000 miles of extrusions!

Our extruders have turned out enough plastic and rubber extrusions to reach to the moon and halfway back. In compiling this vast experience General Tire's Industrial Products Division has supplied thousands of original equipment manufacturers with just about every known type of extrusion. No job is too large, too small or too complicated for our design and production staff. Perhaps you can benefit from the fantastic extrusion mileage we've accumulated down through the years.

For literature or further information write to The General Tire & Rubber Company, Wabash, Indiana, Department D



*"From Plans to Products in Plastics and Rubber"*

# The BUSINESS PULSE

*Credit Has Become More Costly and Less Readily Available. Higher Rates on Commercial Paper, Banker's Acceptances, and Broker's Loans Secured by Customers' Collateral Point Up Mounting Pressure in Money Markets*

This Survey Is Prepared  
Exclusively for AUTOMOTIVE  
INDUSTRIES by the Guaranty  
Trust Company of New York.

## Slight Seasonal Letdown

American business has given an excellent account of itself during the summer period. The customary seasonal lull was less marked than usual, with the result that such over-all measures as output, trade, and employment ran at moderately higher levels, on an adjusted basis, than in the second quarter. Moreover, many signs have emerged during the summer months which point to a continuation of large business volume this autumn. For one thing, the demand for business credit remained exceptionally keen. For another, the Survey Research Center of the University of Michigan reported that consumers remain in a confident and hence a buying mood.

The really big headline news in the trade press of late, however, has not been made either by favorable business reports or by happenings which have propitious implications for the outlook. Instead, the most important economic news in recent weeks has emanated to a very large extent from the trend of events in the money and capital markets. Specifically, credit has become more costly and also less readily available. This could, of course, have a very decided impact upon the pattern of business.

There has been some tendency for interest rates to harden ever since the business upswing got under way, so that the increases which have recently occurred do not represent a completely new tack in the market. The distinctive aspect of recent rate advances lies in the fact that they do very definitely represent an acceleration of the earlier rising trend.

## Rate Changes by Federal Reserve System

The rate changes that have been the subject of the most discussion of late have been those instituted by the Federal Reserve System. In early August the

Federal Reserve Board approved higher rediscount rates for all the Federal Reserve banks. The rate for the Cleveland institution went up by a full half of 1 per cent to  $2\frac{1}{4}$  per cent, while the rate in all other districts was raised one-quarter of 1 per cent to 2 per cent. Presumably the reason for the higher rate in the Cleveland district is that area accounts for a large part of the activity in such industries as steel, automobiles, and machine tools, which have been in the forefront of the demand for capital. Before the month was out two other Federal Reserve banks, those in Atlanta and St. Louis, had also been granted permission by the Board to establish a  $2\frac{1}{4}$  per cent rate, a development which strongly suggests that the other districts may take similar action before long.

## Changes in Prime Lending Rates

Early August also witnessed another very important rate change. At that time—indeed just a few hours before the higher rediscount rates were announced—major commercial banks in New York City advanced their so-called prime lending rates from 3 per cent to  $3\frac{1}{4}$  per cent. This is the rate charged on loans to corporations with the highest credit ratings. It is regarded as the basic rate of commercial banks, and changes in it often signify shifts in the whole structure of rates charged by such institutions.

Other rate changes of recent weeks which point up the mounting pressure in money markets include higher rates on commercial paper, bankers' acceptances, brokers' loans secured by customers' collateral, and foreign deposits held by New York City banks.

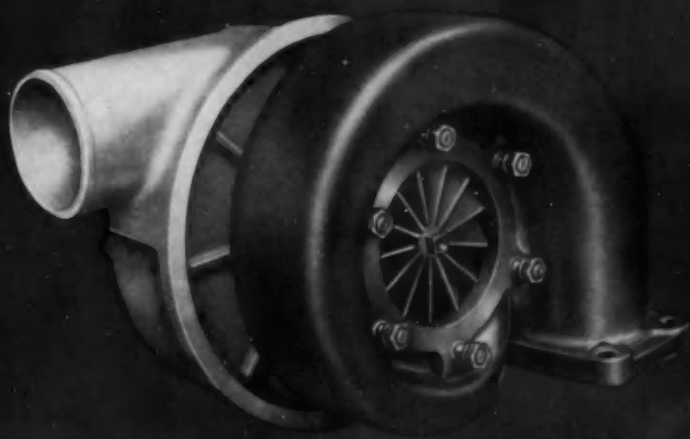
## Availability of Credit

In addition to the foregoing developments which bear on the cost of credit, there have been other happenings of late which affect, either directly or indirectly, its availability. For one thing, the action taken by the Federal Reserve Board in raising rediscount rates implies at least some measure of concern over the degree to which credit expansion has occurred. This in turn implies that the Federal Reserve may be particularly cautious henceforth in making funds available to the economy via the mechanism of open-market

*(Turn to page 178, please)*

# **SCHWITZER**

## **TURBOCHARGERS**



### **OVER ONE HUNDRED MILLION MILES OF COMMERCIAL OPERATION**

After 30 Years of Extensive Research and Production Experience in the Supercharging Field, Schwitzer Now Offers a Complete Line of 4 Sizes of Turbochargers For 50 to 1200 HP Installations. Now in Production in All Heavy Duty Fields — Truck-Tractor-Stationary-Marine.

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**SCHWITZER**  
**CUMMINS COMPANY**  
INDIANAPOLIS, INDIANA

# AIR BRIEFS



By RALPH H. McCLARREN

## Smoother Flying

Rough disturbances caused by turbulent air may soon be but a memory to the air passenger. America's safety-conscious and comfort-considering air-line industry is installing weather surveillance radar on their planes. Using these \$20,000 electric eyes pilots can detect thunderstorms and turbulent air as far as 150 miles away and pick a course to avoid them.

It is the return echo or signal from radar as seen or viewed on a cathode ray tube which tells the pilot where the storm areas are and the best and smoothest path through them.

## New Machines for Aircraft Production

To step up production of airframe parts new milling machines are being developed specifically for the aircraft industry. Production capacity will be increased tenfold over present rates where parts are made on machines which were originally designed for other uses.

Specifications for the new milling machines have resulted from a two year study made by representatives of the aircraft industry, the tool industry and Government officials. It is reported that this is probably the first time in industrial history that consumers and producers have met together on such a large scale to develop an industry-wide program.

## 5-1/2 Million Miles per Day

That is the equivalent distance being flown each day by the 35,000 J47 General Electric turbo-jet engines shipped to the military services since 1948. The distance represents 11,000 flight hours daily . . . the equivalent of a normal air-line schedule involving 340 four-engined transports.

The J47 jet engine with a thrust rating of 6000 lb (7600 lb with afterburner boost) is used to power the Boeing B-47 (six engine bomber), Convair's B-36 (six piston, four jet engines), North American's B-45 (four jets) and all the F-86 Sabre Jets except the F-86H which is powered by a G.E. J73 engine.

During the eight years since the J47 was first delivered more than 20,000 design improvements have been made and the thrust output increased by 23 per

cent. Five years ago the time between engine overhauls was 150 hours. Now it has been increased to 1200 hours.

Detailed performance studies have been made on the J47 engine. Statistics from a survey on 126 B-47 engines showed that parts cost per flying hour (\$2.87) are competitive with present costs on piston engines. The average cost per engine for parts was \$1,676.13.

## Helicopters Aid Flood Rescue

"Whirlybirds" snatched over 1000 persons from rooftops and inundated areas during the recent flood in Northeastern United States. Helicopters from military installations buzzed almost around the clock in saving lives, surveying damage and transporting personnel in the flooded portions of Pennsylvania, New Jersey, Connecticut, New York and Massachusetts.

It was their first mass use during any large peacetime disaster, a real reminder of the huge task they performed in Korea. Certainly the unique flying characteristics of the helicopter, particularly its ability to hover, makes this craft an ideal rescue vehicle.

## Garrett Corporation Expands

Three significant new activities were recently initiated by The Garrett Corp. of Los Angeles. It acquired as a subsidiary the C. W. Marwedel firm, a well known San Francisco industrial supply house. Then work was started on a \$400,000 factory and office building program for its AiResearch Manufacturing Division at Phoenix, Arizona. And Garrett's Air Cruisers Division at Belmar, N. J. has been appointed by the B. F. Goodrich Co. to fabricate Vulcafilm products.

Vulcafilm is a new rubber product which can be electronically welded to give uniform high strength and lifetime seams, eliminating sewed and cemented seams for vulcanized construction.

## Utility Aircraft Deliveries

Keeping posted on the private plane production, we find that in June 489 aircraft were delivered. This makes a January to June, 1955 total of 2474 aircraft

(Turn to page 151, please)



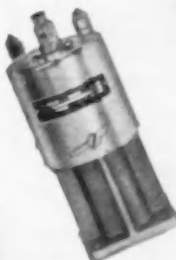
# SPEED SENSITIVE SWITCHES



Model  
GSM



Model  
GH-2



Model  
GA-3

1

Synchro-Start overspeed governors are basically speed sensitive switches designed to open or close a set of contacts when operating speed increases to undesirable proportions. Governors can be supplied to trip at any speed between 500 and 10,000 R.P.M. The underspeed governors are identical in appearance but are built to open or close contacts at a point below their normal running speed. These governors can be furnished to trip at any speed between 400 and 5,000 R.P.M.

2

The two element speed sensitive switch is designed to open or close two independent sets of contacts at two different speeds, both can be independently adjusted. It is particularly adaptable to engine and turbine control systems. Any trip speeds between 500 and 10,000 R.P.M. can be furnished. Automatic transmissions usually require a device for changing torque multiplication at certain specified speeds. The two element unit is ideally suited for such an application.

3

The three element speed sensitive switch performs all functions of the two element switch, but in addition has the exclusive feature of opening or closing three independent sets of contacts, each of which can be independently adjusted. This unit is particularly adaptable to the more elaborate engine and turbine control systems. Almost any combination of trip speeds between 1,200 and 10,000 R.P.M. can be furnished in a standard unit.

*Synchro-Start Products Inc.*

For complete information on all units  
request Bulletin No. 5045.

8151 N. RIDGEWAY AVE.  
SKOKIE, ILLINOIS

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 43

## Motor Wheel Doubles Lawn Mower Output

Motor Wheel Corp. is aiming at becoming the No. 1 maker of power lawn mowers. The company has been marketing two lines of power mowers ever since it purchased the Reo power mower division about a year ago. It now is planning to boost annual production capacity to more than 250,000 units, which would be double present output.

The company will introduce its 1956 line of Reo and Duo-Trim lawn mowers this month. Nineteen different models in all will be brought out with prices ranging from \$79.95 to more than \$300.

## New Firestone Pact Provides 16-Cent Hourly Pay Package

Firestone Tire & Rubber Co. is the first major tire producer to sign an agreement with the CIO United Rubber Workers. The one-year contract, running until Oct. 31, 1956, provides a total pay package estimated at about 16 cents an hour, with the wage increase itself amounting to 12 cents an hour.

Tire companies which have not yet settled on new contracts include Goodyear, U. S. Rubber, and B. F. Goodrich. Negotiations with Goodyear and U. S. Rubber are scheduled to open Sept. 20.

## Walter Chrysler's Home Dedicated As Memorial

The boyhood home of Walter P. Chrysler in Ellis, Kan., has been added to the country's list of historical landmarks. Restored to look as it did in 1889, the two-story frame house, where the Chrysler Corp. founder spent his formative years, has been dedicated as a memorial.

Chrysler Corp. purchased the home for \$7000 and presented the deed to the mayor of Ellis. Many of Chrysler's possessions are shown.

## MODEL CHANGEOVER EFFECTS SHOW UP IN AUGUST 1955 Passenger Car Production

As reported direct to Automotive Industries by the car factories

|                       | August 1955 | July 1955 | August 1954 | Eight Months |           |
|-----------------------|-------------|-----------|-------------|--------------|-----------|
|                       | 1955        | 1955      | 1954        | 1955         | 1954      |
| Hudson                | 2,188       | 2,312     | 3,058       | 39,530       | 21,032    |
| Naah                  | 4,823       | 9,231     | 3,144       | 85,336       | 43,675    |
| Total—American Motors | 7,111       | 12,543    | 7,002       | 124,866      | 64,707    |
| Chrysler              | 244         | 12,083    | 4,392       | 124,000      | 96,774    |
| De Soto               | 802         | 8,431     | 3,892       | 88,128       | 45,582    |
| Dodge                 | 10,490      | 18,654    | 10,807      | 208,532      | 85,756    |
| Plymouth              | 57,020      | 55,477    | 11,572      | 535,467      | 260,570   |
| Total—Chrysler Motors | 69,556      | 94,645    | 30,463      | 957,227      | 458,982   |
| Ford                  | 140,453     | 143,080   | 120,378     | 1,179,291    | 965,976   |
| Lincoln               | 1,764       | None      | 2,979       | 23,610       | 27,350    |
| Mercury               | 26,938      | 33,065    | 17,588      | 293,933      | 189,256   |
| Total—Ford Motors     | 169,155     | 176,965   | 140,945     | 1,496,834    | 1,202,582 |
| Buick                 | 65,383      | 71,822    | 44,276      | 562,062      | 374,438   |
| Cadillac              | 14,064      | 12,878    | 11,048      | 109,943      | 83,440    |
| Chevrolet             | 164,016     | 172,020   | 133,158     | 1,274,976    | 1,016,047 |
| Oldsmobile            | 89,809      | 61,081    | 36,101      | 449,493      | 299,226   |
| Pontiac               | 51,811      | 46,710    | 29,080      | 412,531      | 249,717   |
| Total—General Motors  | 359,763     | 366,321   | 253,673     | 2,809,005    | 2,021,868 |
| Packard               | 4,459       | 5,577     | 2,629       | 53,320       | 23,029    |
| Studebaker            | 8,351       | 3,729     | 1,738       | 64,044       | 49,604    |
| Total—S-P Corp.       | 12,810      | 9,306     | 4,367       | 117,364      | 72,613    |
| Kaiser                | None        | None      | None        | 1,002        | 5,099     |
| Willys                | None        | 18        | 180         | 5,677        | 8,977     |
| Total—Willys Motors   | None        | 18        | 180         | 6,679        | 14,076    |
| Total—All Makes       | 614,395     | 609,018   | 436,650     | 9,531,975    | 3,835,829 |

## More Than 400 Firms Sign For Space At ASTE Show

All indications certainly point toward record attendance at the 1956 Industrial Exposition of the American Society of Tool Engineers. The event is scheduled to be held in Chicago from March 19 to 23. Already more space has been reserved for the show than was used in 1952, although six months still remain before the exposition opens. More than 400 concerns have already contracted for space.

## Famous Ford-Made Planes To Be Shown In Dearborn

Two of the once famous Tri-Motor airplanes, built by Ford in the late 1920's, will be exhibited at the Dearborn test track Sept. 18 as part of a "homecoming" celebration sponsored by the Ford Aeroports Club. The event, commemorating the 25th anni-

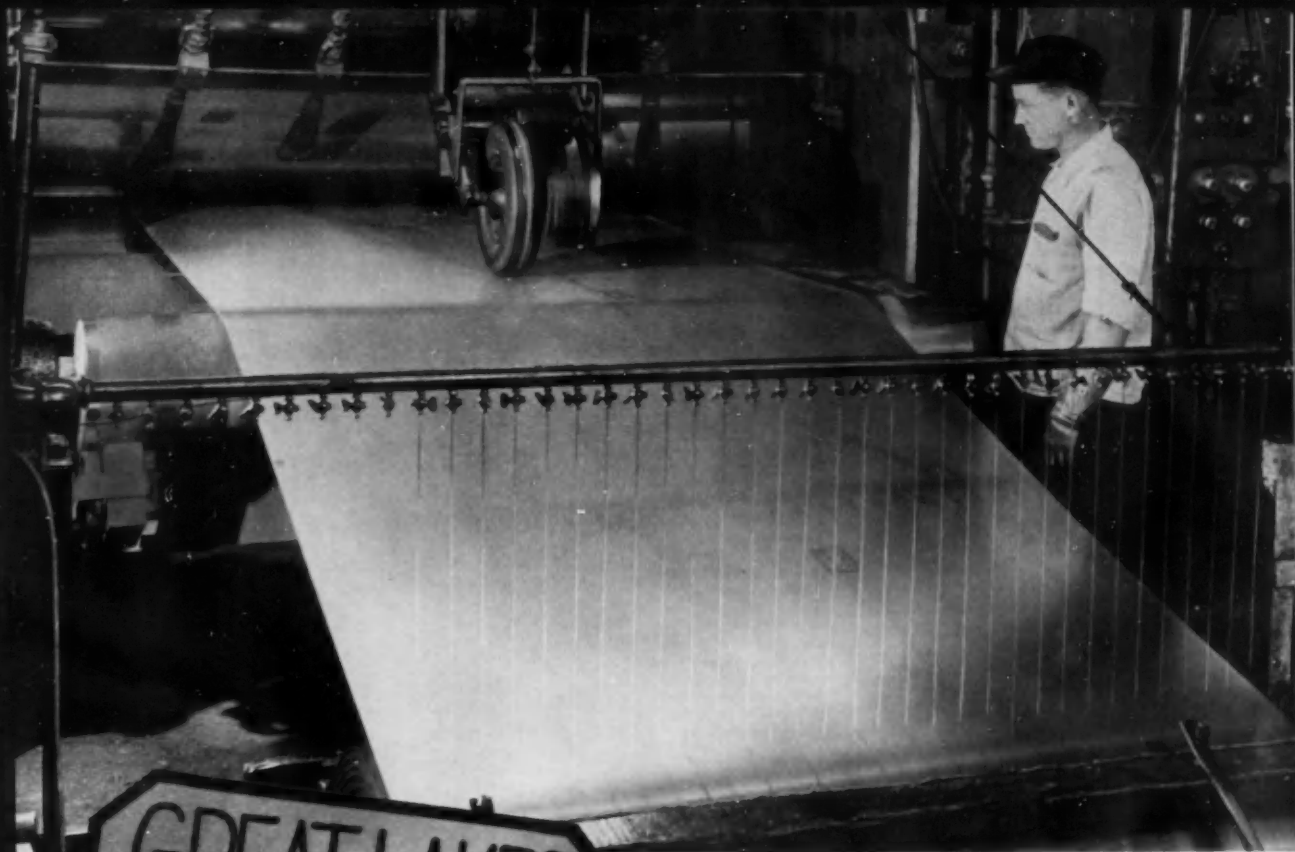
versary of the old National Air Tour, will bring together many of the engineers and pilots who developed and flew the aircraft in the pre-depression days.

Ford started building the all-metal craft in 1926, but growing competition in the then-young aircraft industry forced the company to discontinue it in 1933. The planes were designed to carry 15 passengers and had a cruising speed of 80 mph.

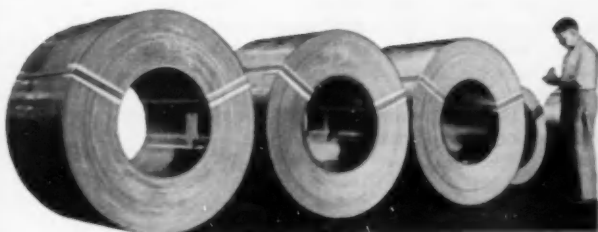
## Ford, Chrysler Make Grants To Cornell For Crash Study

Ford and Chrysler announced simultaneous grants of \$200,000 each to Cornell University for further automotive crash research studies. Data gathered from the studies is expected to help car makers considerably in developing safety features on automobiles.

(Turn to page 106, please)



Devices such as the one shown in operation above stamp our steel with our name. Each lift and coil Great Lakes Steel produces carries such a stamp or tag bearing an identification number from which the complete history of the material concerned can be obtained.



## How Great Lakes Steel *identifies* quality

Because this identification helps us give better service to our customers, it is an important aid toward an all-important goal. The goal can be summed up: *Give each customer the quality of steel to meet his requirements—when and as wanted.*

Men throughout the mill insist on *quality with service* for our customers.

We invite you to talk over your production problems with a Great Lakes representative. His assignment is to bring into your plant the steelmaking knowledge and experience of the Great Lakes organization.

**GREAT LAKES STEEL CORPORATION**

Ecorse, Detroit 29, Michigan • A Unit of

**NATIONAL STEEL CORPORATION**

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 104

## Predict 61 Million Vehicles On Road By End of This Year

The torrid sales and production pace by automobile manufacturers is reflected in a report by the Bureau of Public Roads showing the number of vehicles in use in the nation. Basing its prediction on reports from state registration agencies, the Bureau estimates that the country's fleet of cars, trucks, and buses will rise by 4.6 per cent to a total 61.3 million this year.

The number of passenger cars is expected to total 50,954,000 this year, an increase of more than five per cent over last year. Trucks and buses are expected to total 10,347,000, a 2.8 per cent gain.

Last year, total motor vehicle registrations rose 4.1 per cent, and the year before that they climbed 5.7 per cent. By 1965, the Bureau predicts, the total motor vehicle fleet will soar to 81 million.

## Howell Motormobile To Bring Products Direct to Customer

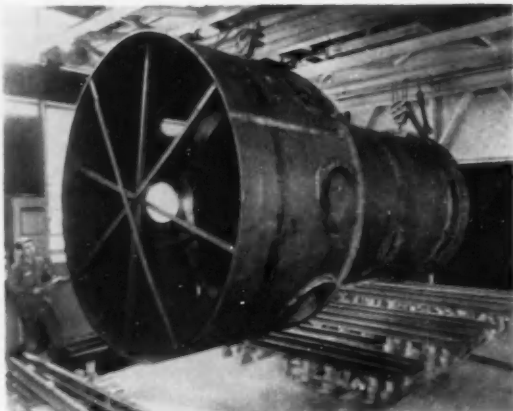
Howell Electric Motors Co. has developed what it feels is the answer to the problem of giving customers and prospects in-action product demonstrations, when the product involved is too unwieldy for a salesman to bring to a client's desk. The Howell Motormobile, described as a "laboratory-on-wheels" is a red-and-white trailer, housing a mobile show to bring Howell's story right to the door of the customer's plant.

Motors are shown operating under full load along with graphic demonstrations of their construction features. Highlighting the show are the company's new Series 100 motors, with advanced features of ventilation, bearing construction, and overall efficiency.

Gearmotors, torque motors, brake motors and disk motors are among the other Howell units displayed. At one end of the trailer, a lighted panel

## SIZE MATTERS LITTLE HERE

Being lined up for normalizing in a giant furnace at the Van Dyke, Mich., plant of Nor-Cote, Inc., is a huge cupola tower. To be used on a gray iron furnace, it is 28 ft long, 11 1/2 ft in diameter, and weighs 17 1/4 tons. The Nor-Cote normalizing and full annealing furnace has a 100-ton capacity and will handle individual parts 40 ft long.



of installation photographs shows the products of several manufacturers that utilize Howell motors for power

## Demand For Power Steering, Brakes High at Oldsmobile

A report from Oldsmobile illustrates the continued high demand for power assist features on automobiles, particularly power brakes and power steering. Oldsmobile notes that 68 per cent of all the cars it built in the first six months were equipped with power brakes and 58 per cent with power steering.

The demand for electrically-operated seats and windows, on the other hand, is not as great. Only 18 per cent of the buyers specified electric-powered windows, while 19 per cent requested electric-powered seats.

## Car Dealer Licensing Law Is Approved By Wisconsin

A new law passed by Wisconsin dealing with the licensing of car dealers may set a pattern for other states to follow. Under the new legislation, called the "anti-stimulator" bill, the Motor Vehicle Dept. can refuse a dealer's license to a car manufacturer if it feels the present dealer in a particular area is giving satisfactory representation under the manufacturers' requirements.

## Russia Out to Widen Range Of Its Vehicle Production

Russia's introduction of the Volga M-21 and 35-hp Moskvitch (see A1, June 1, p. 70) is soon to be followed by other new models.

Production of a cross-country passenger car, based on the jeep-like GAZ-69 chassis, is scheduled to start this year at Gorki. This is the four-door Pobeda M-72, and includes an hydraulic torque converter and four-wheel drive to give a top speed of 55 mph on sand or snow.

There is also a report of a 35 hp two-seater with a 300-lb cargo capacity. Designated as the Ukrainetz M-73, it is intended for agricultural technicians and is equipped with low-temperature starting and running equipment.

Manufacture of the ZIS-127 long-distance coach has started at the Stalin works in Moscow. It seats 32 passengers, is powered by a rear-mounted, 180-hp, six-cylinder, two-stroke Diesel engine, and includes an air conditioning installation. The first 100 of these buses will be turned out this year.

Further production of specialized vehicles is also planned. Among these are the MAZ-502 logging truck, concrete transporters, and cotton trailers, as well as some one and 1 1/4-ton trucks.

(Turn to page 164, please)



Photo by Barre Inc.

I am a typewriter. Across my ink-stained face are written many human experiences. During the coming beautiful fall days, I shall pound into the record books many names.

I SHALL WRITE—Killed, passing on a hill, John Doe.—Killed, passing on a curve, Bill Doe, wife and 3 children.

I SHALL ALSO WRITE—"To save a minute, he lost a life" or "A minute saved—a quick trip to the grave."

Tired, hackneyed phrases describing the end of bubbling, enthusiastic, happy lives.

I write on...pounding names into the record books of death.

What's YOUR name? What's YOUR WIFE'S name? How many CHILDREN have you?

Because so many answer, I must write—I must work. YOU can make every day safer for yourself and your family by driving EXTRA carefully. Please be courteous, be careful—I CAN SPELL ANY NAME.

Automobile manufacturers and automotive suppliers are continually improving cars to help reduce the accident-causing tensions of driving. One of these suppliers, Auto Specialties Mfg. Co., Inc. of Saint Joseph, Michigan, has developed safer brakes for today's more powerful cars: Auto Specialties Double-Disc Brakes. These brakes, designed on an entirely new principle, have passed severe braking tests at leading car factories. Auto Specialties Double-Disc Brakes make driving safer, make drivers surer of their brakes. Their adoption by the car factories will be in keeping with the automotive industries' aim for safer and safer driving. So while you're out driving, be courteous, be careful. Remember, "I CAN SPELL ANY NAME."

A 16-page, 4-color book, "The Stopping Story," gives detailed information about these brakes. It's free. Write for it to

## AUTO SPECIALTIES MFG. CO., INC. Saint Joseph, Michigan

Plants also at Benton Harbor and Hartford, Michigan and Windsor, Ontario, Canada  
Manufacturing for the automotive and farm machinery industries since 1908



## Electronic Misfire Counter for Spark Plug Testing

(Continued from page 73)

that occur in a specific time interval.

This misfire counter has been used in an extensive study of the effects of various fuel additives on the useful life of spark plugs. The data obtainable from the instrument provide an early indication of spark plug failure as evidenced by marked increase in the misfiring rate when a plug ap-

proaches the end of its useful life. This feature is valuable since random or intermittent misfiring can be detected, and costly engine tests can be terminated long before the misfiring becomes severe enough to be detected by ear or by other less sensitive instruments.

The accompanying graph shows the

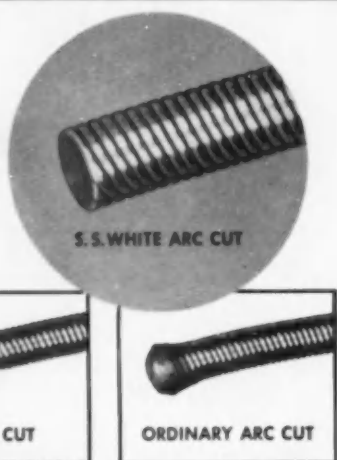
accumulated engine misfires that were observed by the counter in tests run to evaluate four different fuel additives. Curves A, B, and C all have well defined points at which misfiring rates suddenly increased. These points establish the effects of these different additives on useful spark plug life. In the test run with additive D, however, no marked increase in fouling rate was observed during 80 hours of operation. It has been possible, therefore, to compare quantitatively different additives using reasonable short engine tests, and eliminate those that have an adverse effect on plug performance.

For the event counting by electronic circuitry, the unit required a transducer to detect the occurrence of the events and represent them by electrical signals, a pulse shaping circuit to transform the signals into standardized pulses suitable for operating a counter, and an electro-mechanical or electronic counter for registering the events as they occur. Engine misfire counting complicates this sequence somewhat since the absence of events rather than their occurrence is to be counted. For this purpose two signals from the engine were required: a reference signal that occurs each time the engine should fire, and a signal that indicates that the engine has fired. The two signals are transformed into uniform electrical pulses and fed into a comparison circuit that produces an output pulse only if a reference pulse is not accompanied by a "firing" pulse. Output pulses from the comparison circuit are, therefore, indications of engine misfires and are registered as such on an event counter.

The electronic misfire counter uses for its reference input signals the electrical impulses that appear across the primary breaker points of the ignition system each time they open to produce a spark in the secondary. These signals are easily obtained from any engine by connecting a single electrical lead to the distributor. Reference signals might be obtained also from magnetic, photoelectric or capacitive pickups, but they do not afford such ease of installation.

Signals to indicate that the engine has fired are obtained from an auxiliary spark plug which is installed in the combustion chamber in addition to the ignition spark plug. When the engine fires, the free ions present in the flame reaction render the gap of the auxiliary plug conductive. A d.c. voltage lower than the value required for arc discharge is impressed across the gap to cause current flow in the external circuit when ionization oc-

## A world of difference ...



### ...when S.S.White developed the first successful arc-cutting machine for speedometer cable

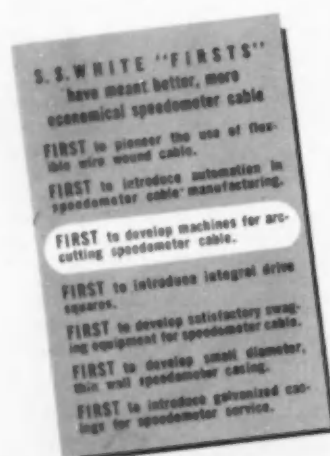
Not so long ago, the three principle methods of cutting speedometer cable to length were shear-cutting, swage-cutting and arc-cutting. All three were time-consuming and costly.

Shear-cutting left the wire ends exposed and in danger of unraveling; swage-cutting produced uneven wire ends and reduced the diameter of the cable end; known arc-cutting methods left a bulb or flash which had to be removed in secondary operations.

Recognizing the problem, S.S.White developed a special arc-cutting machine which cut, sealed and fused the cable in one quick, easy operation and maintained the uniform diameter and tension in the shaft thereby eliminating all secondary operations. The S.S.White arc-cutting machine was soon made available to the trade and is now in daily use by most speedometer manufacturers.

This was one of many "FIRSTS" that have contributed to the outstanding quality and reputation of S.S.White Speedometer Cable.

**S.S.WHITE INDUSTRIAL DIVISION**  
10 East 40th Street, New York 16, N. Y.



9-4

**S.S. White**

**FIRST NAME**

in flexible shafts for speedometer drives,  
industrial power drives and remote control.



## These Combat Twins can score a smash hit!

REPUBLIC'S F-84 "THUNDER TWINS" —  
TWO MORE VITAL MILITARY AIRCRAFT  
WITH MAJOR COMPONENTS by **TEMCO**

These twins complement each other ideally. Thunderflash, the photo reconnaissance twin in the foreground, locates the targets. Thunderstreak, the A-bomb carrying fighter-bomber, smashes same. Designated RF-84F and F-84F, these combat twins are two of the Air Force's most versatile planes. In addition to their regular missions, the Thunderflash has a special assignment. It has been equipped to be carried kangaroo fashion in the belly of a B-36 and launched or retrieved in the air. Thus, fighter speed over the target is coupled with bomber range — a formidable combination. Republic keeps production schedules smooth on these planes by subcontracting several assemblies, including rear fuselage sections of both, to TEMCO. Work on these vital planes is reinforcing TEMCO's well established reputation for producing a quality product, on schedule, at one of the lowest costs in the industry.



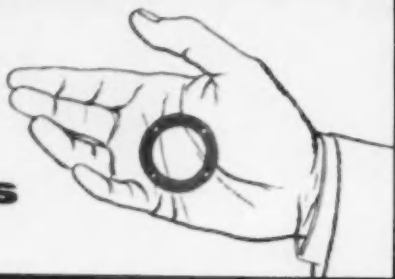
Thunderstreak and Thunderflash rear fuselage sections nearing completion on TEMCO assembly lines.

**ENGINEERS** . . . If you are interested in a position with a growing weapon systems organization, write full particulars to E. J. Horton, Jr., Engineering Personnel, TEMCO Aircraft Corporation, P. O. Box 6191, Dallas 2, Texas.



from

## Grease Retainers



# FELT

BY FELTERS

solves your design problems

Whether you want to hold grease in,  
filter air or provide a wicking method,  
you'll find the answer in

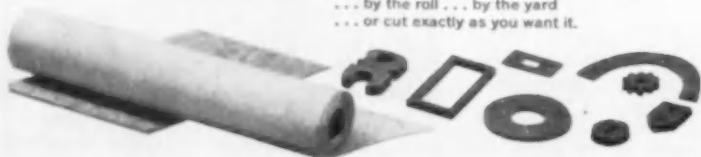
Felt by Felters.

Many types and densities of felt are described  
in the new Felters Design Book.  
Write for your copy today.

THE FELTERS CO., 253 South St., Boston 11, Mass.

### FELTERS FELT

... by the roll ... by the yard  
... or cut exactly as you want it.



FELTERS S.A.E. F-26 is a felt suitable for packing or padding when held in place by other materials, but is not recommended for mechanical purposes.



curs. The presence of a flame in the combustion chamber is thereby evidenced by a pulse of electrical current. This is the electrical signal required for an indication of engine firing.

The instrument is compact and easy to install and operate. The only special installation required was the ionization gap spark plug which was inserted in the spare accessory hole provided in single-cylinder research engines. All timing adjustments are located on the front panel of the instrument. The output register is capable of counting speeds as high as 60 pulses per second. This corresponds to a four-cycle engine speed of 7200 RPM which is well above any speed encountered with standard engines.

## Automatic Handling

(Continued from page 54)

machine parts are loaded into a hopper and fed by a Feedall unit to the first grinder. As they emerge from the first grinder, they enter a special machine designed to burnish the ball seat automatically. Then they move on a track through two more centerless grinding operations, winding up at an inspection station.

Since the foot of the barrel is hardened, a carefully planned quality control procedure is used to check hardness. In this instance a sampling procedure is employed in view of the enormous volume of parts in process. If the sampling procedure does not disclose off-standard heat treating, the individual lots are accepted without further checking. However, if any defects are found the entire lot is subjected to 100 per cent inspection. To achieve maximum economy in such instances, the division has designed some special automatic testing machines as illustrated. The gaging unit is so arranged as to sort the work in three groups—OK, too hard, too soft—and will eject them into the proper chutes. The battery of machines illustrated here is fed by the same general arrangement described earlier: a hopper, Feedall unit, chute for transport to the testers, and a belt conveyor for transporting accepted parts.

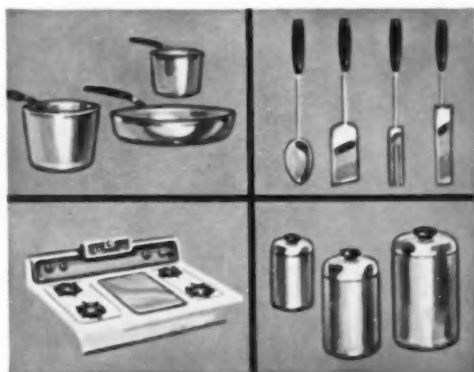
Final assembly of valve lifters has been organized with the maximum of automaticity to reduce manual effort to the minimum. Because of the volume involved and also because of differences in design for each make of engine, the company has a separate assembly line for each customer.

**modern design specifies stainless steel**



## **McLouth** *STAINLESS* **Steel**

**for the home**



The lady agrees with the architect that her modern, cheerful, Stainless Steel kitchen will be the most beautiful room in the new house. Stainless Steel is the bright, long lasting metal that will not tarnish, is easy to clean and a joy to live with.

For the product you make today and the product you plan for tomorrow specify McLouth high quality sheet and strip Stainless Steel.



**McLOUTH STEEL CORPORATION**  
*Detroit, Michigan*

MANUFACTURERS OF STAINLESS AND CARBON STEELS

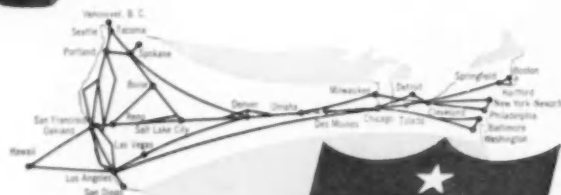
**"We shipped this child's dress  
coast-to-coast by United Air Lines  
Air Freight for only 14 cents!"**



"Time is all important to our salesmen," says Mr. Fred Rosenau, president of Rosenau Brothers, Inc., Philadelphia, world's largest manufacturer of children's dresses, "and we know we can depend on United Air Freight to get our dresses to them when needed. Then, too, shipment and delivery speed gives us more time here at the plant to incorporate the latest style trends and fabrics. The cost? Surprisingly low—about 14 cents to ship a dress coast-to-coast. All of which is why we use United Air Lines almost exclusively to ship to the West Coast and Hawaii."

**United Main Line Airway** follows the bustling business belt across the nation. At any point along this strategic route, United can furnish fast connections with other air carriers, truck lines and rail transportation to reach any section of the world. And only United offers Reserved Space Air Freight on all flights—more than 254 Mainliner® flights daily—not only over its own routes, but world-wide through connecting airline agreements.

For speed, dependability and economy, learn the advantages of United Air Lines Air Freight Service. Call the nearest United Representative or write for free booklet, "Industry's Flying Partner," Cargo Sales Dept. 1-9, United Air Lines, 5959 S. Cicero Avenue, Chicago.



**Whatever your product—speed, dependability  
and low cost are yours when you ship by United Air Freight**

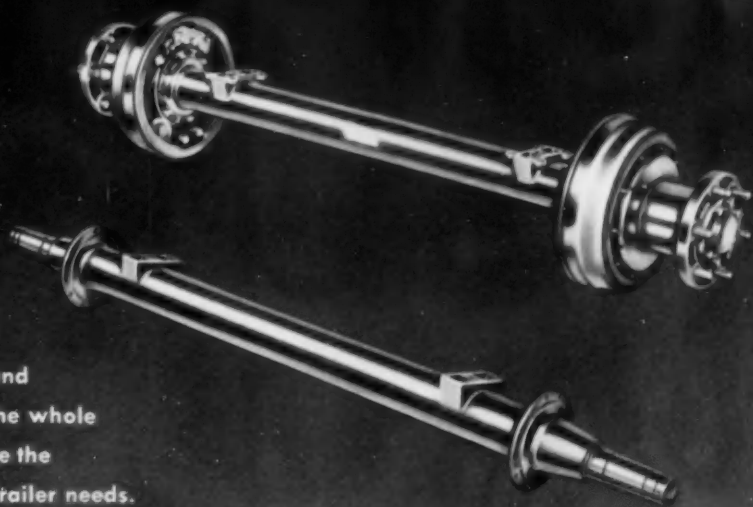






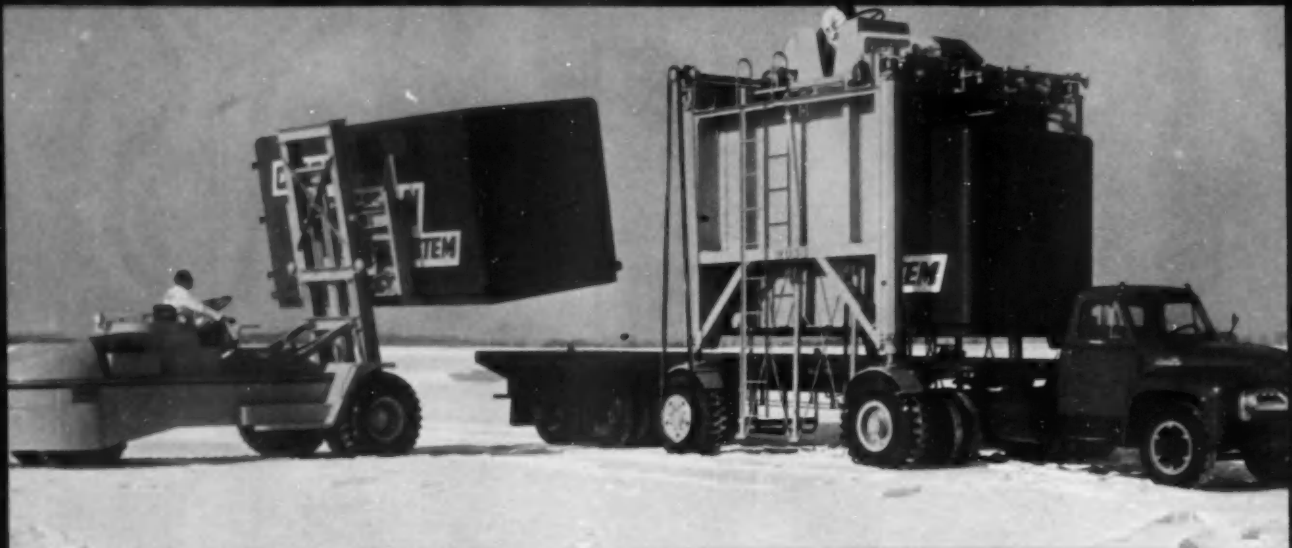
## Clark axles for Trailers

Simplicity, strength and low unsprung weight—that ideal combination!—are engineered together in Clark Trailer Axles. A high carbon steel tube with integral forged spindles—spring seats and brake mountings welded on—the whole unit heat-treated: there you have the light, rigid, tough axle a good trailer needs.



**CLARK®**  
**EQUIPMENT**

CLARK EQUIPMENT COMPANY • JACKSON • Buchanan, Battle Creek and Benton Harbor, Michigan



## Load 40,000 lbs. of material in seconds with **CLARK'S MOBILVAN SYSTEM!**

In the search for faster, more efficient ways to move material, Clark Equipment Company has developed the Mobilvan System—designed to speed freight movement by truck or rail or combination of both.

The 20,000-lb. capacity vans are actually sturdy mobile-warehouses; cargo is loaded into them conventionally. Then, as shown in the photograph, a 30,000-lb. Clark lift truck or straddle-type carrier lifts them intact

aboard a flatbed trailer. A unique locking device automatically secures the "Mobilvans" to the bed of the trailer. The same basic procedure applies to shipments by rail flatcar.

Lift truck or straddle-type carrier can be used interchangeably, depending on terminal conditions. An experienced operator of either can load a "Mobilvan" onto a trailer or flatcar in approximately 25 seconds. Standard flatcars or trailers require only the

simple, inexpensive installation of the automatic locking device for Mobilvan service.

The "unit load" principle of the Mobilvan System cuts handling time. The one-man operation of lift truck or carrier cuts overhead. And since "Mobilvans" can be set aside until their contents are needed, the system frees expensive rolling equipment and valuable warehouse space for more productive use.



Write  
for  
6-page  
folder  
containing  
details  
and  
schematic  
drawings  
of the  
Mobilvan  
operation.

**CLARK**  
EQUIPMENT

Industrial Truck Division  
**CLARK EQUIPMENT COMPANY**  
Battie Creek, Michigan

## Turbo Gas Generator for Tip Jet Helicopters

(Continued from page 66)

Mounted on top of the square-section outlet of the collector is a two-position, non-throttling valve. It is used during starting to divert the confluent gases from the rotor head to atmosphere through a starting nozzle. When normal engine speed is reached, the drum-type valve is manually rotated to seal off the escape path and direct the full pressure to the rotor. The area of the starting nozzle can be varied by a butterfly valve. The persisting outer layer of air also cools this unit and insures satisfactory operation of the valve.

At the front of the engine, behind the accessories mounting plate, is the annular air intake. This is intended for plenum chamber installation, and is therefore not protected against icing or debris. The main compressor is of multi-disk construction, the hubs being bolted together to form a large-diameter shaft. Stator blades for the first three stages are shrouded, and the remaining nine cantilever. Mass flow is 9.9 lb per sec., and pressure ratio is 6 to 1 at maximum revs.

The compressor characteristics are stated to give optimum engine efficiencies well removed from surge. Variable inlet guide vanes controlled by a speed sensing servo increase this margin at low speeds.

The tubular combustion chambers are fired by upstream injection burners, following the pattern of the Napier Eland turboprop which was the first British engine to use this system. (See AI, Sept. 1, 1954.) Burners can be withdrawn separately for inspection. Suitable fuel is either kerosene or wide-cut gasoline.

The reaction-type turbine is designed to run against the high back-pressure created by the updraft of air from the auxiliary compressor. Expansion ratio is 3.14 to 1.

The drive shaft to the auxiliary compressor at the rear passes through the hollow center of the collector. Blade pitch of this compressor is reversed in relation to that on the other rotary units in order to provide the inward air flow. Pressure ratio is 1.8 to 1 and air mass flow is 5.1 lb per sec at 21,900 rpm. Adjustable inlet guide vanes in the annular intake can be present for matching.

The forward-mounted accessories are driven from the main shaft through a gearbox. These include a fuel pump, combined oil pressure and three-bank scavenge pump, and an rpm generator. Drive is available

for an engine synchronizing unit.

Engine control is effected by a Napier fuel metering unit having single lever operation. This automatically compensates for changes in ambient pressure and temperature. There is also an overspeed governor and fixed-datum turbine inlet temperature control.

Net dry weight is 495 lb, with an

additional 60.5 lb for the non-throttling valve with associated expansion joint. Overall length without accessories is 83.5 in., and maximum diam excluding collector is 19.25 in.

The Oryx has already run for over 1400 hrs on test, and will soon be installed in a Hunting-Percival P.74 helicopter. Type test to the 750 ghp rating will be attempted by the end of this year, when preliminary development at 825 ghp will also begin. A rating of 900 ghp is expected to be reached by the end of 1956, according to the company.

## BASEMENT BARGAIN for Paint Finishing

**NOW P-D ENGINEERING—CONSERVES floor space...  
UTILIZES basement areas for disposition of paint  
laden air... RETURNS washed and filtered air.**

This new installation of a Peters-Dalton Hydro-Whirl Finishing System in the plant of a major manufacturer of milling machines has overcome many serious problems. In this case, dirty, inefficient, and dangerous conditions otherwise thought insoluble have been overcome. The machines made here are of huge size (castings weighing up to 90,000 lbs.) and handling operations must necessarily be held to a minimum. Complete finishing operations now can be carried on by any number of men—working on all sides of the machines—in unpolluted air. The Finishing System engineered and built by Peter-Dalton permits the placing of these machines in a room fitted with floor gratings. The paint laden air (over 150,000 CFM) is drawn down through these gratings to a lower level and thence through the P-D washer sections, where it is "knocked down" by the Hydro-Whirl scrubbing action which returns it washed and filtered to the finishing room. It is a finishing system that not only solves the problems of a particular manufacturer but is so excellent that it meets insurance company standards and code requirements of most states for the return of cleansed air to a room.

Finishing Systems by Peters-Dalton are designed for the job—to do the job. Whatever your needs... from cabinet size to installations comparable to the one illustrated here... depend upon P-D designing and engineering. If you want to modernize, economize, increase production and efficiency, we'll be glad to tell you more. Just write, wire or phone.

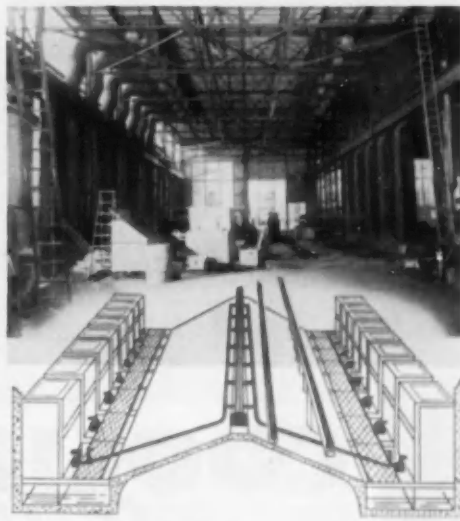
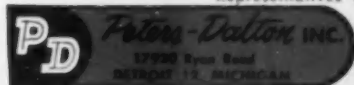
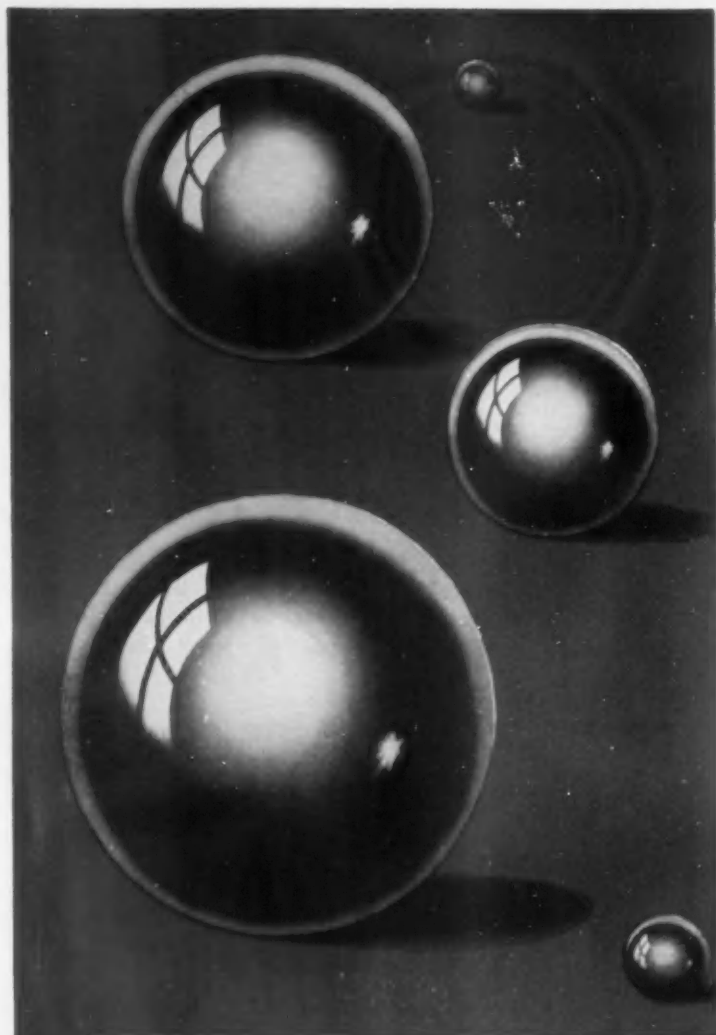


Photo (while under construction) and Drawing of P-D Finishing System above illustrate (1) the complete freedom of movement without loss of any floor space, and (2) the elimination of expenditure for air make-up because of cleansed air-return feature of this installation.

Representatives in Principal Cities



- ☐ Hydro-Whirl Paint Spray Booths
- ☐ Industrial Washing Equipment
- ☐ Drying and Baking Ovens
- ☐ Hydro-Whirl Dust Collecting Systems



## COOLIDGE *Balls*

CHROME ALLOY AND STAINLESS

COOLIDGE CORPORATION  
MIDDLETOWN, OHIO

## New Renault

(Continued from page 76)

recessed in its face, a steel armature plate, an intermediate plate and a pressure plate. The friction plate is of the conventional type, with splined hub, frictional contact being through four sectors, faced on each side with Ferodo 437. In addition to the friction sectors, the plate carries four light friction studs mounted on spring blades. These studs are of Ferodo M8 and intended to assure light permanent friction, with very low torque, just sufficient to take up play but not to drive the vehicle.

Normally current is supplied direct from the generator and is led to two carbon brushes on bronze collector rings mounted on the pressure plate.

When current passes through the flywheel coil, the armature plate is drawn up to the flywheel. As the pressure plate is positively linked to the armature, it is brought towards the intermediate plate, which is integral with the flywheel, thus exerting pressure on the friction plate. The degree of pressure is in relation to the attraction of the armature by the flywheel and is determined by the current passing through the coil. When the current is cut, the armature is no longer drawn towards the flywheel and the pressure plate ceases to bear on the friction plate.

Progressive take-up of the drive is assured by the variable output of the generator, in relation to its speed of rotation, and by the progressive elimination of the resistances of two rheostats. With the engine throttled down, the clutch is automatically released. When gear changes are made, the movement of the lever momentarily cuts the current through a relay connected up to the throttle, the clutch being released and the throttle closed simultaneously.

While normally the generator is relied on to supply current for clutch operation, current can be drawn from the battery, but in this case there is no automatic declutching.

Current consumption under normal running on the generator is 5 amp, and for emergency operation on the battery  $2\frac{1}{2}$  to 3 amp. Extra cost for the electro-magnetic clutch will be \$75.

*Executives read*

**AUTOMOTIVE INDUSTRIES**

**IF IT MOVES  
WE CAN STOP IT!**



# TDA BRAKES

...for every industrial  
or automotive application where  
braking is required!

## P SERIES POWER BRAKES designed for heavy-duty automotive service



These rugged, heavy-duty power brakes are designed to give longer troublefree service on trucks, truck-tractors, trailers, buses, trolley-coaches and industrial and road equipment.

Superior design has made Timken-Detroit's "P" Series brakes the undisputed choice of leading vehicle manufacturers everywhere. Friction and heat are reduced sharply, cutting the biggest cause of brake wear. Other important features of the "P" Series brakes offer increased economy and performance for operators.

"P" Series power brakes are available in a complete range of capacities and sizes. Either air or hydraulic action ... to meet every operating need.

**For additional information** ... with expert consultation, contact the Timken Brake Division. Complete details and specifications on the "P" Series brakes are available. And, a staff of highly experienced engineers can assist you with any brake problem that you may have.



### Easy accurate brake adjustments

Slack adjusters permit quick, simple adjustments. When adjustment is made, spring-loaded lock automatically engages adjustment screw to prevent screw backing off during service.



**Cooler running**  
Open-type, malleable iron brake spiders eliminate air pockets and assure adequate internal ventilation for cooler running.



**Constant Lift  
"S" Type Cam**  
Constant lift "S" type cam assures uniform application of brake shoes for maximum sensitivity and controllability.

### Longer liner life with "Econoliner"

Timken Detroit Econoliner liners are tapered to provide greater strength and thickness at the center where wear is greatest.



### Better brake drums

Sturdy, rugged brake drums are designed to supply maximum rigidity with rapid heat dissipating ability.



Plants at: Detroit, Michigan • Oshkosh, Wisconsin  
Utica, New York • Ashtabula, Kenton and Newark, Ohio  
New Castle, Pennsylvania ©1955 R S & A Company



# World's Largest Plating Facility

(Continued from page 59)

ating pushbuttons adjacent to each station.

Operation on Storage means that the empty plating racks remain at the top of the machine instead of feeding down to the loading section. In preparation for week-ends, the last two hours are run on Storage. The machine operates as usual, except that as the racks are unloaded they stay in the rack storage area above the ma-

chine. This allows free access to the entire machine for inspection and maintenance.

Installed as a part of the control system are unique Electro-Graphic Detector panels built by W. F. & John Barnes for maintenance purposes. These consist of large illuminated panels showing the complete electrical system in schematic diagram—with wired-in checking circuits. Each point

on the schematic which represents a contact, such as a limit switch, contactor, or timer, is actually wired to that particular component, either on the machines or in the control panels. Therefore, when it is necessary to check a component or circuit, an electrician simply locates the component on the Electro-Graphic Panel, and using a test probe, checks the circuit for correct operation. This eliminates the necessity of going directly to the components for testing and makes possible the checking of the machines with the power on. Over 3¼ million ft of wire—or 710 miles—was used in the installation of the control and checking circuits.

Direct current, low voltage power for plating processes is supplied by 48 Chandeysson motor-generator sets ranging in size from 7500 amperes at nine volts to 20,000 amperes at 12 volts. Total d-c output of the generators is 652,000 amperes. Over a half million pounds of copper bus bar was used to connect the generators with the tanks.

Ventilation for all tanks requiring it is supplied by 30 blowers and six air washers having a combined capacity of 979,500 cu ft per minute. Hoods run the width of each tank to draw off the vapors at the source, keeping the area adjacent to the machine free from contamination.

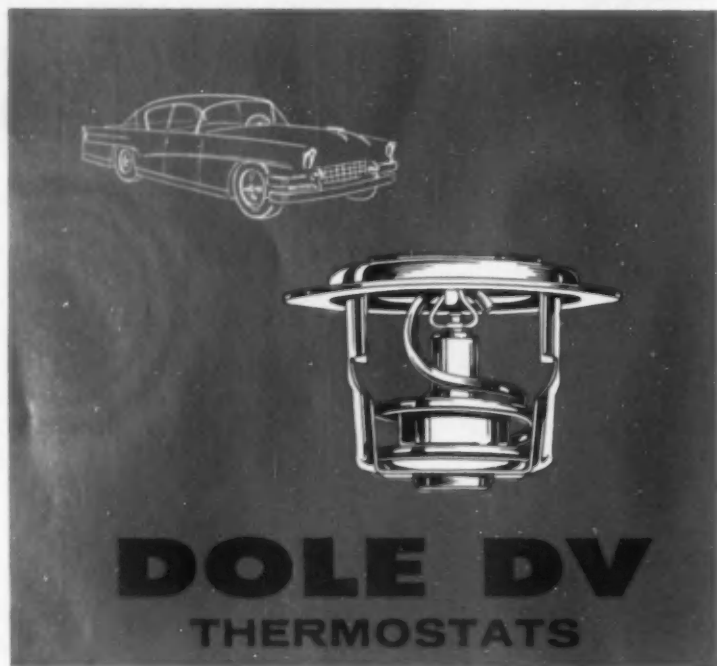
## Self-Adjusting Valve Tappet

(Continued from page 67)

cold room. It was found that the tappet recovered without noise on the cold starts. By nature, the silicone polymer has very little change of viscosity within engine operating temperatures. Another inherent feature of the fluid is its high shear resistance under heavy loads. Therefore, leakdown and recovery rates are rather consistent regardless of engine speeds.

Thompson Products has also developed a special four-station machine which is capable of automatically assembling tappets in large volume. The silicone fluid is put into the tappet by vacuum filling, and the tappet is sealed with the assembly under a vacuum of 50 microns in the new silicone tappet filling machine.

**AUTOMOTIVE INDUSTRIES  
KEEPS YOU INFORMED**



## ... for best engine performance

Engineered for modern high-compression engine design to give accurate temperature control with pressurized cooling systems. Speeds warm-up—saves gasoline and oil—reduces engine wear. Gets more heat from the car heater.

Now original equipment on thirty-four (34) leading makes of cars, trucks, tractors, commercial vehicles, industrial and marine engines.

Literature sent on request—please use your letterhead.

Control with Dole  
TRADE MARK

# DOLE

**THE DOLE VALVE COMPANY**

1901 W. Carroll Ave., Chicago 12, Ill.

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• Los Angeles

• Philadelphia

**ANTISEP**

the all-purpose water-soluble cutting base



## Making machine tools pay off faster is a job for

**ANTISEP**

Machinists continue to marvel at the results they get with Antisep All-Purpose Base, and so will you.

Antisep is economical to use, because water is the diluent—25 to 1 for most jobs. That's low price per gallon in the machine.

Combine this economy with the greatly increased production obtained with Antisep Base, and the result is cost saving that makes machine tools *pay off faster!*

**ANTISEP** all-purpose cutting base

... a product of



Ready to give you  
on-the-job service ...

# BASIC

for  
weighing  
and  
testing



## EMERY FORCE-MEASURING SYSTEMS

Emery hydraulic load cells, operating on simple, basic principles, are the fundamental solution to *any* force-measuring or weighing problem. Maintenance-free and dependably accurate, Emery systems are ideal for:

- ★ Process Control
- ★ Testing Materials
- ★ Measuring torque and thrust
- ★ Tank, bin, platform weighing

**TYPES:** Self-contained and open-flow hydraulic, pneumatic, standard, and remote indicating, recording . . . **RANGES:** 0 — 10,000,000 lbs. **ACCURACY:** 1/10 of 1% of range . . . **RESPONSE:** less than 1/2 second.

Since 1872 Emery force-measuring systems have been lowest in initial cost and operating expense. Requiring no maintenance, some units have been in service 25 years without recalibration!

*Write today for information on stock or special designs.*



**THE A. H. EMERY COMPANY, NEW CANAAN 8, CONN.**

Please send me:

- ☐ Literature on hydraulic weighing
- ☐ Literature on pneumatic weighing

NAME \_\_\_\_\_

POSITION \_\_\_\_\_

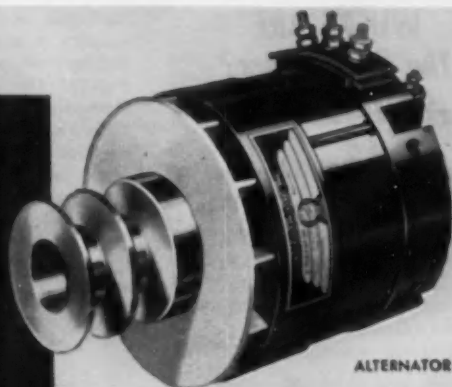
Attach to, or write on, your company letterhead.

## CALENDAR

OF COMING SHOWS AND MEETINGS

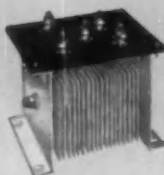
- General Motors Powerama, South Lake Shore Drive, Chicago, Ill. . . . . Aug. 31-Sept. 25
- National Industrial Packaging and Materials Handling Show, Kingsbridge Armory, New York, N. Y. . . . . Sept. 20-22
- AAMVA Annual Conference, Somerset Hotel, Rockland, Me. . . . Sept. 20-23
- ASME Annual Meeting, Roosevelt Hotel, New Orleans, La. . . . Sept. 25-29
- First Trade Fair of the Atomic Industry, Sheraton-Park Hotel, Washington, D. C. . . . . Sept. 26-30
- AIEE and IRE Industrial Electronics Conference, Engineering Society Auditorium, Detroit, Mich. . . . . Sept. 28-29
- Small Gas Turbine Symposium, Polytechnic Institute of Brooklyn, Brooklyn, N. Y. . . . . Oct. 1
- AIEE National Electronics Conference, Chicago, Ill. . . . . Oct. 3-7
- AIEE Fall General Meeting, Hotel Morrison, Chicago, Ill. . . . . Oct. 3-7
- World Plastics Fair and Trade Exposition, National Guard Armory, Los Angeles, Calif. . . . Oct. 5-9
- Society of Industrial Designers, annual meeting and design conference, Woodner Hotel, Washington, D. C. . . . . Oct. 6-8
- Navy-Industry Conference on Packaging and Materials Handling, Washington, D. C. . . . . Oct. 10-12
- ASME-ASLE Joint Lubrication Conference, Antlers Hotel, Indianapolis, Ind. . . . . Oct. 10-12
- Air Transport Association, engineering and maintenance conference, Baker Hotel, Dallas, Tex. . . . Oct. 11-13
- SAE Golden Anniversary Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif. . . . Oct. 11-15
- National Metal Exposition, Convention Hall, Philadelphia, Pa. . . . Oct. 17-21
- National Safety Congress and Exposition, Chicago, Ill. . . . . Oct. 17-21
- International Motor Show, Earls Court, London, England, Oct. 19-29
- AGMA Semi-annual Meeting, Edgewater Beach Hotel, Chicago, Ill. . . . Oct. 23-26
- Canadian Industrial Tool and Equipment Show, Montreal, Canada . . . . . Oct. 24-29
- ASME-IME Joint Conference on Combustion, London, England . . . . Oct. 25-27
- ASDE Annual Technical Convention, Detroit, Mich. . . . . Oct. 26-28
- National Conference on Industrial Hydraulics, La Salle Hotel, Chicago, Ill. . . . . Oct. 27-28
- Automobile Old Timers, 16th anniversary dinner, Waldorf-Astoria Hotel, New York, N. Y. . . Oct. 28
- SAE Golden Anniversary National Transportation Meeting, Hotel Chase, St. Louis, Mo. . . . Oct. 31-Nov. 2
- National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago, Ill. . . . . Oct. 31-Nov. 2
- SAE Golden Anniversary National Diesel Engine Meeting, Hotel Chase, St. Louis, Mo. . . . . Nov. 2-4
- SAE Golden Anniversary Fuels and Lubricants Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. . . . . Nov. 9-10
- ASME Diamond Jubilee Annual Meeting, Congress, Conrad Hilton, and Sheraton-Blackstone Hotels, Chicago, Ill. . . . . Nov. 12-18

# Leece-Neville



ALTERNATOR

RECTIFIER



REGULATOR



## New AC-DC ALTERNATOR SYSTEM DELIVERS 125 Amps

**Weights only 44 lbs.  
Costs much less than comparable  
d.c. system**

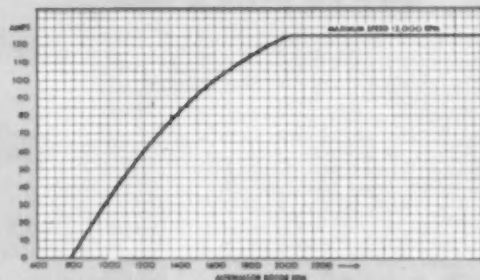
At the price you formerly paid for a 100 ampere L-N Alternator System, you now get 125 amperes ... and at a cost far below that of a d.c. generator.

Built on a 6 $\frac{3}{8}$  inch diameter frame, the Alternator weighs only 27 lbs. Rectifier and Regulator bring the total weight of the generating system to only 44 lbs. Compare that with the weight of a d.c. generator of the same output and you'll find an important weight saving.

The performance curve shows the low cut-in speed and rapid attainment of full output. Charging current at engine idle speed will vary with drive ratio.

This new L-N Alternator System is ideally suited for many types of vehicles with 12 volt electrical systems: buses, trucks, trolley coaches, school buses, fire trucks, mine and construction equipment. For applications requiring a fan-cooled rectifier, an Alternator with a shaft-mounted fan at rear is available.

PERFORMANCE AT 12 VOLTS



There are L-N Alternators with capacities ranging to 95 amperes for 6 volt systems; to 180 amperes for 12-volt; to 100 amperes for 24 volt; and to 50 amperes for 32 volt. All of them have the rugged design and precision manufacture that give L-N Alternators unmatched reliability and long life. Be sure to specify Leece-Neville.

Since 1946, L-N Alternators have been helping fleet owners cut operating and maintenance costs. For all the facts, write The Leece-Neville Company, Cleveland 3, Ohio. *Distributors in principal cities . . . service stations everywhere.*

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RELY ON**

**Leece-Neville**

Automotive Electric Equipment Since 1909

TRUCK • BUS • DIESEL • INDUSTRIAL • PASSENGER • RAILROAD • MARINE • OFF-HIGHWAY



ALTERNATOR SYSTEMS



D.C. GENERATORS



CRANKING MOTORS



REGULATORS



SWITCHES



SMALL MOTORS

## WHERE ARE The Dream Cars?

(Continued from page 74)

Convertible, and the Adventurer II. The Firearrow Roadster mockup has been scrapped.

Of the more than 30 dream cars to be brought out by the General Motors styling studios, seven have been "mothballed," two have been completely dismantled and only about a half dozen—excluding the seven

1955 idea cars—are still touring the country in smaller shows or used by dealers for special promotions. Only two of the oldtimers, the super-streamlined 335-hp XP-300 and the LeSabre, are being used by the corporation itself. Both are successors to the famous "Y Job," Harley Earl's first experimental car, and the first "idea" car introduced in the automobile industry by GM in 1938.

Both cars are still serving their purpose in testing new devices for both styling and engineering innovations. Harley Earl, of course, likes to keep close tab on the LeSabre

and every now and then takes it out for a spin.

The famous "Y Job," which had many innovations 10 years and more ahead of its time, is now in "mothballs" with several of its brethren, including such once big public attractions as the Cadillac El Camino hardtop, Cadillac LaEspada, Cadillac Park Avenue, Buick Wildcat I, Cadillac LeMans and the Chevrolet Corvair. The Oldsmobile Starfire, an advanced design convertible coupe, brought out in 1953, and the original Chevrolet Corvette of 1953, are the only GM experimental cars which have been totally dismantled, however. The Starfire influenced many of the styling features on the Oldsmobile production convertible 98.

Only GM cars which can be seen periodically at shows throughout the country—in addition to the 1955 versions—are the Pontiac Strato-Chief, Pontiac Bonneville Special, Oldsmobile Cutlass, Olds F-88, Buick Wildcat II, Pontiac LaParisiene and the gas turbine powered XP-21 Firebird. The Buick Landau Special, a specially designed luxury car, is now used by Buick's New York zone office as a special "brass hat" car.

The plastic-bodied Chevrolet Corvette, of course, today can be spotted on the roads in all parts of the country. Most famous of the GM's 1953 "dream cars," it is the first such car to go into production. Another GM dream car, the Chevrolet Nomad station wagon, was placed into production in 1955, and Pontiac has a 1955 station wagon, the Safari, modeled after the original Nomad styling.

GM's 1955 experimental vehicles still touring the country at various extravaganzas include the Chevrolet Biscayne, Pontiac Strato-Star, Buick Wildcat III, Oldsmobile 88 Delta, Cadillac Eldorado Brougham, the LaSalle II sports coupe and LaSalle II sedan. Of these, the Cadillac Brougham is expected to be put into limited production next year.

Ford Motor Co. built only six experimental cars—the Mercury Monterey XM-800, XL-500, XL-100, FX-Atmos, Syrtis, and the \$250,000 "laboratory on wheels," the Lincoln Futura. The life of the XL-500 was cut short when its glass-reinforced plastic body was damaged while loading it in New York, and it was scrapped shortly afterwards.

Another pet project of the advanced styling department of Ford, the Syrtis, shown only once to the Detroit press about two years ago, is in mothballs. The Futura, which recently made a grand circuit around

## Hardened and Ground Parts are our Specialty

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-27½" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 —.001.

Parts like this are our specialty—we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

*Henry W. Brown*  
PRESIDENT

### Experienced production on:

King Pins • Wheel Studs  
Shackle Bolts • Shackle Pins  
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...anything in the hardened and  
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up to 4½" diameter.

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**DESIGNS  
AND  
MAKES**

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**LONG MANUFACTURING DIVISION  
BORG-WARNER CORPORATION  
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DETROIT 12, MICH.—WINDSOR, ONT.**

## A Good Fisherman Doesn't Trust to Luck



Alodized aluminum canoe designed and built by Metal Boat Company Division of Grumman Aircraft Engineering Corporation, Marathon, N. Y.



**S**uccessful angling is the result of studying feeding habits, selecting the proper lure and the right equipment. To catch bass, and other game fish requires a different technique for each species. The good fisherman doesn't trust to luck.

Similarly, there's no substitute for "Know-How" and that's particularly true in adapting metal treating chemicals to established production. It can't be gotten out of books, through black magic or out of a crystal ball. Only years of active contact, with actual manufacturing procedures, can be depended upon for satisfactory solutions of the metal protecting problems constantly confronting manufacturers.

ACP offers ideal products for removing and preventing rust on metal, chemicals to bond paint to steel, zinc, and aluminum, and pickling acid inhibitors. In addition, ACP furnishes a free service of an organization of technical experts with over 40 years' experience in solving metal preservation problems for the largest as well as the smallest operation.

Rely on service backed by experience. You are obligated in no way by consulting our technical staff.

**Write or call for further information on  
ACP chemicals for metal protection.**

**AMERICAN CHEMICAL PAINT COMPANY**

Ambler, Pa.

Detroit, Mich.

Niles, Calif.

Windsor, Ont.



the country in shows, is being checked over in the engineering department in Dearborn, Mich. Only the Atmos, X-100 and XM-800 remain on the road.

All of Packard's four non-production cars are still touring the country in shows and dealer promotional activities. A fifth car, the Caribbean, has been in production since it was built in 1953 as a special style-pilot series. Now in its third edition, the Caribbean was one of Packard's first major moves in a product development program aimed at recapturing its former position in the luxury car field.

Special market research studies are being conducted by Packard among Caribbean owners and results used to guide future product planning. The car is offered in selected market areas only, with annual output limited to under 1000 units. Under present allocation plans, Packard ships no more than five of the luxury models to any one city.

The "grand daddy" of Packard's experimental cars is the Pan American, brought out in 1952 and at present involved in a suit instituted by Pan American World Airways. The airline company is seeking to prevent Packard from using the words "Pan American." No decision on that litigation has been reached yet, however.

The Pan American is still on a pilgrimage of the country along with its mates, the Packard Request, the Balboa, and the Panther-Daytona.

Car manufacturers would have no trouble trying to market their idea cars, if they decided to do so. Practically every one of the cars has had a cash bidder. A wealthy man in France took such a fancy to Ford's X-100 while it was on tour there that he was willing to pay \$500,000 for it. Ford had a hard time convincing the man that the "magnifique" car was not for sale.

Most of the "dream cars" brought out by the industry have been devoted more to styling rather than engineering changes, and that is evident from the number of styling innovations which have been transplanted to production cars, and which undoubtedly will continue to be seen in increasing number on cars coming off production lines in the future. Some of the more important styling features which Chrysler has adapted from its futuristic cars include the "gunsight" tail lights and open rear wheel housings on the Imperial, taken from the K-310 and Chrysler Special; lower hood treatment; push-button



4140 steel is your best bet for light and heavy sections

AISI—SAE 4140

| C         | Mn        | Pmax      | Smax  |
|-----------|-----------|-----------|-------|
| 0.38/0.43 | 0.75/1.00 | 0.040     | 0.040 |
| Si        | Cr        | Mo        |       |
| 0.20/0.35 | 0.80/1.10 | 0.15/0.25 |       |

4100 steels are your best bet

Chromium Molybdenum Steel like AISI-SAE 4140 is doing a job economically in both light and heavy sections. Whether in the equipment that drills an oil well — or bolts for a thousand uses, plentiful 4100 Moly steel does a better job. We can show you how.

Climax Molybdenum Company, 500 Fifth Avenue,  
New York 36, N. Y.



**CLIMAX MOLYBDENUM**

"One day we were using

14 hand sprayers  
...the next day, 2

"One day we were using

180 gallons of paint  
...the next day, 75

"Fantastic?" Not exactly. It's a typical, on-the-job-example of the savings made possible with the

**RANSBURG NO. 2 PROCESS**

*Electrostatic Spray Painting*

And, in this instance\* production was increased; quality of the work improved, and rejections cut to practically nothing.



\*Fluorescent Fixtures of California, in their modern plant in South San Francisco, uses the Ransburg No. 2 Process Reciprocating Disc Atomizer to paint their popular line of ALL-BRITE lighting fixtures. The quotes above are from Works Manager, R. H. Shaffer.

Regardless of the type of product you manufacture, if it's painted... and, if your production justifies conveyorized painting, you should look into the savings (and improved quality) which can be yours with one of the Ransburg Electrostatic Painting Processes. May we tell you about complete Ransburg services?

Write to Dept. A

*Ransburg*

ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

type door handles, to name only a few.

Many of the features inspired by the famous GM "Y Job" now are found on present stock models, including electrically actuated convertible tops and door windows, and fender extension over doors. Wrap-around windshields made their first appearance on GM idea cars. But, all in all, dream cars have proved to be an expensive business. From all indications the public will be seeing fewer of them in the future, despite its interest in them. General Motors already has indicated that it will cut down on the number of futuristic cars it will show in coming years. Of course, its stylists still will keep on dreaming, but many of the "dream boats" probably never will see production and sale.

## New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to July 13, 1955, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the August 15 issue, page 118 of **AUTOMOTIVE INDUSTRIES**, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from July 14 to July 27, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

EX-CELLO-O CORP., Lima, Ohio  
Military engine parts—\$129,160 (40)

TEMCO AIRCRAFT CORP., Garland, Tex.  
Military aircraft assemblies—\$550,000 (45)

PHEOLL MANUFACTURING COMPANY, Chicago, Ill.  
Titanium aircraft rivets—\$129,640 (65)

BEECH AIRCRAFT CORP., Wichita, Kans.  
Military aircraft—\$123,326 (65)

UNITED AIRCRAFT CORP., East Hartford, Conn.  
Aircraft engines and parts—\$954,000 (55)

## AUTOMOTIVE INDUSTRIES...

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Automotive and Aviation

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**LEADING ENGINE BUILDERS**

**USE SEALED POWER**

**CHROME RINGS**

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As the use of chrome has followed the development of modern engines, more and more leading engine builders have adopted Sealed Power chrome rings, both for original equipment and replacement sets. Today the total is 28, and the number is still growing.

Sealed Power's method of applying chrome results in a plating that is heavy and permanent. Sealed Power's method of factory-lapping to a light-tight finish assures fast break-in and immediate oil control.

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Leading Manufacturer of Automotive and Industrial Piston Rings since 1911  
Largest Producer of Sealing Rings for Automatic Transmissions • Power Steering Units



## More Government Contract Awards

**T**HIS latest list of Government prime contracts that have been awarded covers the period from Aug. 1 to Aug. 22, 1955. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

**AEROJET-GENERAL CORP.**, Azusa, Calif.  
Jet assist take-off units—190 ea.—\$120,458

**AVCO MANUFACTURING CORP.**, Lycoming Div., Williamsport, Penna.  
Engines. O-435-23—37 ea.—\$174,434

**BENDIX AVIATION CORP.**, Bendix Products Div., South Bend, Ind.  
Brake assemblies for F-102MTU Aircraft 282 ea.

Brake assemblies for F-102MTU Aircraft—5 ea.—\$227,159  
Brake assembly for F-86F aircraft—1282 ea.  
Wheel assembly for F-86F aircraft—520 ea.  
Brake assembly for C-47 aircraft—211 ea.—(PR 498,167)—\$454,943

**BENDIX AVIATION CORP.**, Utica Div., Utica, N. Y.  
Starters, pneumatic—1607 ea.—\$3,433,696  
Spare parts

**BOEING AIRPLANE COMPANY**, Seattle, Wash.  
Facilities for the production of B-52 aircraft—(PR 148,836)—\$10,620,399  
Jet-tanker aircraft spares—29 ea.—\$46,107,900  
Special tools

**BORG-WARNER CORP.**, Long Manufacturing Div., Detroit, Mich.  
Develop link track design—RAD—\$77,927

**CATERPILLAR TRACTOR COMPANY**, East Peoria, Ill.  
Generator sets, 100 KW, spare parts—56 ea.—\$670,246

**CHRYSLER CORP.**, Detroit, Mich.  
Auto parts—various—\$32,822  
Tank parts—11963—\$1,303,994

**CLEVELAND DIESEL ENGINE DIV.**, GENERAL MOTORS CORP., Cleveland, Ohio  
Repair parts—13,283 ea.—\$198,843  
Spare parts—12,945 ea.—\$59,317

**CONSOLIDATED DIESEL ELECTRIC CORP.**, Stamford, Conn.  
Mobile electric power plant unit—120 ea.—\$1,608,240

**CONTINENTAL AVIATION & ENGR. CORP.**, Detroit 14, Mich.  
Development of V-12 cylinder multi-fuel air-cooled engines—\$665,000  
Design development Test & construct 10 cylinder engines—\$555,902  
Conversion of model TD6467 engines to new "M" combustion principles—RAD—\$153,095  
Design, development & mfg. A01 1195-5 engines—job—\$49,470

**CONTINENTAL MOTORS CORP.**, Detroit, Mich.  
Spare parts—681 ea.—\$52,331

**CURTIS-WRIGHT CORP.**, Propeller Div., Caldwell, N. J.  
Prop assemblies  
Spinner assemblies—76 ea.—\$2,900,581  
Kits for XB-47D propellers—\$110,591

**CURTIS-WRIGHT CORP.**, Metals Processing Div., Buffalo, N. Y.  
Extruded tubes, of titanium alloy—165 ea.—\$216,779

**FAIRBANKS-MORSE & COMPANY**, Fair Lawn, N. J.  
Repair parts for Diesel engines—24,121 ea.—\$250,317

**FAIRCHILD ENGINE AND AIRPLANE DIV.**, FAIRCHILD AIRCRAFT CORP., Hagerstown, Md.  
C-123B aircraft—73 ea.  
Spare parts, special tools—\$12,000,000

**FORD MTR. CO.**, Dearborn, Mich.  
Resource engr. study for producing tank, 90MM gun—job—\$793,800

(Turn to page 132, please)

# PAYLOADER<sup>®</sup> by HOUGH

## is built to be TOUGH!





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## CONVERTER and CLUTCH

are coupled in the husky new Model HA "PAYLOADER" to give it a rugged, trouble-free TORQUE CONVERTER DRIVE which multiplies output and provides smooth, shockless power flow for severe service.

Whatever your clutch or converter application, consult our engineering department without obligation. Like Hough, you can always depend on Borg & Beck to come up with the right answer.

**BORG-WARNER CORPORATION**  
Chicago 38, Illinois

*for that vital spot where power takes hold of the load!*



**BORG & BECK**  
DIVISION



**New!  
Revolutionary!**

# Colonial **ONE-WAY** Surface Broacher

**"Eliminates" Return-Stroke  
"Eliminates" End of Stroke  
"Doubles" Length of Stroke**

For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55.

**MECHANICAL DRIVE  
AC MOTOR**

**VARIABLE SPEED**

**HYDRAULIC OR  
MECHANICAL FIXTURES**

**CARBIDE OR  
HSS BROACHES**

**NO PIT REQUIRED  
FOR LOW CEILING**

**LONGER TOOL LIFE**

**EXTREME ACCURACY  
GUARANTEED**

**STROKE LENGTH  
UP TO 200 INCHES**

**SPEEDS UP TO 50 FEET/MIN.**

**ONE LONG STROKE—**

**ONE PART**

**OR**

**MULTIPLE SHORT STROKES  
ON MULTIPLE PARTS**

**CONTINUOUS OPERATION**



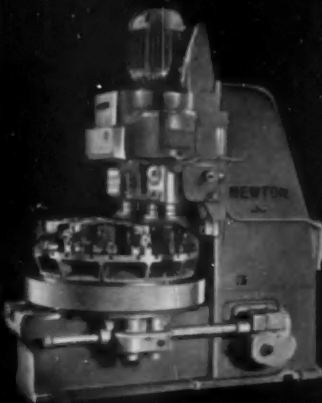
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Rotary Milling Machines that  
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A DIVISION OF FARREL-BIRMINGHAM CO., INC.

COMPANY ROCHESTER 10, N. Y.

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AI-95

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Title .....

Firm Name .....

Address .....

City ..... Zone ..... State .....

(Continued from page 128)

**GAR WOOD INDUSTRIES, INC.**, Wayne, Mich.

Auto parts—\$121—\$46,917

**GENERAL ELECTRIC CO.**, Philadelphia, Penna.

Diesel engine repair parts—164 ea.—\$36.845

**GENERAL ELECTRIC CO.**, Schenectady, N. Y.

Design, develop and test a dovetail turbine wheel for the CH8-F1 turbo supercharger—3 ea.—\$68,829

**GENERAL ELECTRIC COMPANY**, West Lynn, Mass.

Turbochargers—367 ea.—\$1,256,241

**GMC, AC SPARK PLUG DIV.**, Flint, Mich.

Fire control—lot—\$251,862

Retrofit kit, bombing navigational computer—\$15 ea.—\$2,155,446

Auxiliary engine tank—2791 ea.—\$25,009

**GENERAL MOTORS CORP.**, Allison Div., Indianapolis, Ind.

Special tools and ground handling equipment—\$288,000

Aircraft engines, T56-A-1—192 ea.—engines less reduction gear assembly and related parts—364 ea.—\$53,732,000

Overhaul of J-35 aircraft engines—834 ea.—\$1,679,410

Housing, transmission—23 ea.—\$26,367

**GENERAL MOTORS CORP.**, Detroit Diesel Engine Div., Detroit 28, Mich.

Engines and spare parts—18 ea.—\$86,752.80

**GMC, Pontiac Mtr. Div.**, Pontiac, Mich.

Spare parts for 20MM guns—3,825.2 sets—\$7,553,369

**GRAY MARINE MOTOR CO.**, Detroit 7, Mich.

26BHP gasoline marine engine with 2:1 reduction gear—31 ea.—\$29,726

**HOLLEY CARBURETOR CO.**, Detroit 4, Mich.

Fuel control—1600 ea.—\$5,163,120

**LOCKHEED AIRCRAFT CORP.**, Burbank, Calif.

Modification of RC-121D aircraft—9 ea.—\$533,128

**MOORE SERVICE INCORPORATED**, El Paso, Texas

Refueling and defueling services—\$129,000

**PIASECKI HELICOPTER CORP.**, Morton, Penna.

Spare parts—\$38,236

**THE RAMO-WOOLRIDGE CORPORATION**, Inglewood, Calif.

Facilities for the performance of research and development for project atlas. (PR 199235)—\$100,000

**REO MOTORS, INC.**, Lansing, Mich.

Auto parts—various—\$171,067

**STUDEBAKER-PACKARD CORP.**, Detroit, Mich.

Trucks, cargo—\$943,825

**SUNDSTRAND MACHINE TOOL COMPANY**, Aviation Div., Rockford, Ill.

Spare parts—\$831,321

**TEMCO AIRCRAFT CORP.**, Dallas, Texas

Army L-17 aircraft—6 ea.—\$341,479

Ground control station—3 ea.

**TWIN DISC CLUTCH COMPANY**, Racine, Wis.

Repair parts for Diesel engines—various—\$33,862

**VICKERS, INC.**, Detroit, Mich.

Spare parts for 280MM gun—item—\$173,298

Hydraulic mtr. assy.—100 ea.—\$63,400

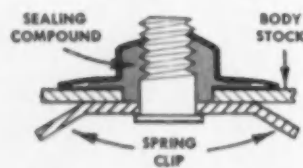
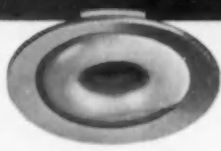
**WILLIS MOTORS, INC.**, Toledo, Ohio

Station wagons (IFB 4G-50313-B)—20 ea.—\$43,111.40

## Here's the most effective, low-cost lock nut to Seal out Water, Dirt and Dust



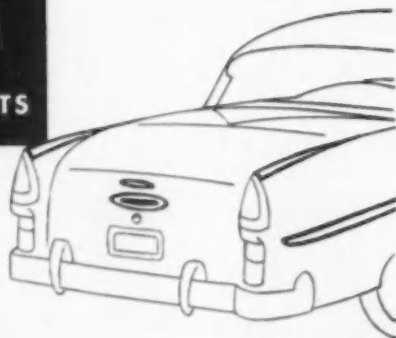
**SEALER TYPE  
PALNUT**  
Trademark®  
**WASHER LOCK NUTS**



### Stud Damage Reduced

Washer PALNUTS eliminate the common causes of die cast stud damage. The PALNUT single threaded removes plating burrs while tightening. Thread engagement is high on stud, therefore studs need no threads at base and are stronger. Resilient spring steel washer base cushions the shock of power drivers on stud.

when fastening  
emblems, moldings and handles  
on rear deck, quarter panels  
and rear fenders



The one-piece Sealer Type Washer PALNUT Lock Nut does the job of an ordinary nut, lock washer, flat washer and sealing unit. It costs less—assembles faster—holds more securely—offers more advantages than any sealer-type fastening method.

Resilient spring steel construction greatly eliminates stud damage or dimpling of body stock. Sealing compound completely seals around threads and stud clearance. Washer spans stud hole, can not chafe edges to cause corrosion.

### The PALNUT Company

60 Cordier St., Irvington 11, N. J.

For full details and free samples contact our Detroit office.

730 West Eight Mile Road, Detroit 26, Michigan  
Telephone: Jordan 4-6087

## BOOKS...

**BUSINESS MANAGEMENT HANDBOOK**, by J. K. Lasser, published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price, \$8.50. In convenient, one-volume form, this book brings you an authoritative, detailed collection of the successful methods of the nation's outstanding businessmen. Here is concrete help to show the executive how to talk, think, and plan with the kind of well-rounded authority expected of top management. The book covers a wide range of business practice—from such things as organizing a business and locating it, starting a new business or buying or selling an established one, and financing and borrowing, to buying insurance and doing business abroad. This book covers each departmental operation from the top down—explains such procedures as how to streamline distribution, run a cost system, design systems of internal control, control operations through budgeting, avoid business frauds, and cut paper work in half. In addition, there are numerous tips and pointers on marketing and public relations that have saved and made money for all types of organizations.



# BROACHING without CHATTER

is easy, on the **LAPORTE** VUE-7

*the world's first* **ELECTRO-MOTIVE POWERED  
pull-up BROACHING MACHINE**



Spiral gear  
before and after  
being broached

Built for high production, and using two identical broaches rotated in true synchronism by a sturdy lead bar, this new LAPORTE machine broaches helical internal gear automotive parts two at a time, at a rate of 320 parts per hour . . . at 80% efficiency!

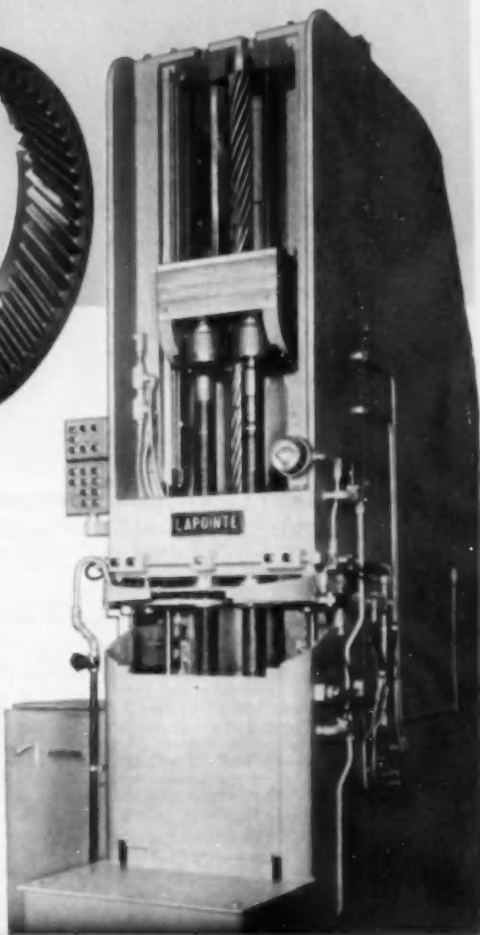
No wonder that it broaches without chatter: it has massive, quiet gears . . . a heavy, rigid frame . . . and electro-motive drive! No wonder, either, that because of these features the work is more accurate, and tool life is increased 400% to 500% between grinds!

## LAPORTE VUE-7

for broaching speeds of 10 to 100 feet-per-minute.

Can be built in other types and sizes up to 50 tons.

Send today for literature. Ask for Bulletin VUE-7-10.



THE **LAPORTE**

**MACHINE TOOL COMPANY**

HUDSON, MASSACHUSETTS • U. S. A.

In England: Watford, Hertfordshire

MADE  
IN  
U.S.A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

# INDUSTRIAL POCKETSCOPE

by

**Waterman**

MODEL S-11-A

DC-COUPLED  
WORK-HORSE OF  
INDUSTRY

Size:  
11" x 5" x 7"  
8 3/4 Pounds



## ANOTHER EXAMPLE OF **Waterman** PIONEERING...

The INDUSTRIAL POCKETSCOPE, model S-11-A, has become America's most popular DC coupled oscilloscope because of its small size, light weight, and unique flexibility. This compact instrument has identical vertical and horizontal amplifiers which permit the observation of low frequency repetitive phenomena, while simultaneously eliminating undesirable trace bounce. Each amplifier sensitivity is 0.1 Volt rms/inch. The frequency responses are likewise identical, within -2 db from DC to 200 KC. Their total undistorted outputs permit effective trace expansion of twice the screen diameter. The internal sweep generator is continuously variable from 3 cycles to 50 KC and can be synchronized from positive going signals. Return trace blanking is optional. Intensity modulation is accomplished by connecting either directly to the grid of the three-inch cathode ray tube or thru an amplifier having a gain of approximately 10 and a flat response to 500 KC. Direct intensity modulation threshold voltage is approximately 1 volt rms. Additional provisions for direct access to all the deflection plates, the second anode, and the amplifier output terminals extend the usefulness of the S-11-A many fold.

## WATERMAN PRODUCTS CO., INC.

PHILADELPHIA 25, PA.  
CABLE ADDRESS: POKETSCOPE

### WATERMAN PRODUCTS INCLUDE

S-4-C SAR PULSESCOPE®  
S-5-A LAB PULSESCOPE  
S-6-A BROADBAND PULSESCOPE  
S-11-A INDUSTRIAL POKETSCOPE®  
S-12-B JANIZED POKETSCOPE®  
S-14-A HIGH GAIN POKETSCOPE  
S-14-B WIDE BAND POKETSCOPE  
S-15-A TWIN TUBE POKETSCOPE  
RAYONIC® Cathode Ray Tubes  
and Other Associated Equipment



## SHORTIES

Direct foreign investments of U. S. companies now stand at a peak of \$17 billion and are increasing at an annual rate of almost \$1.5 billion.

Between 420 and 450 tons of steel products, on the average, are required for every million dollars spent on highway construction.

The U. S. automotive industry has produced 136 million motor vehicles in 54 years—47 million of them since World War II.

More than 60 million motor vehicles are expected to be on the road by 1957.

Four million persons are employed in sales jobs in the U. S. today—an average of one out of every 16 employed workers.

One-third of the 70 million drivers of cars, trucks, and buses in the U. S. are women.

A tiny new air turbine to cool supersonic aircraft cabins is so small it can be held in one hand, yet it has the cooling capacity of a ton of ice an hour.

Southern use of passenger cars has doubled since 1945, when registrations in 16 southern states and the District of Columbia totaled 6,213,430. In 1953, they hit 12,634,063.

Taxes take 28 cents out of every dollar spent to buy automobiles.

More than 9.7 million are employed in highway transport industries of the U. S., or one of every seven workers.

The nation's highway users are paying special automotive taxes at a record-breaking rate of \$6 billion annually.

**COOL GO**

**FOR BUICK'S DYNAFLOW!**



Every Dynaflow transmission ever built has been equipped with a durable, dependable Harrison oil cooler.

Hot performer . . . but cool as they come! That's Buick's famous Dynaflow transmission! And it's kept cool—at perfect operating temperature—by Harrison! In fact, Harrison oil coolers control temperature on millions of the best-known, most-dependable automatic transmissions on the road today! Harrison heat control products are rugged and reliable . . . designed to save space, weight—money, too! And with our extensive research facilities, we're constantly searching for, and *finding*, better ways to build all kinds of automotive, aircraft, marine and industrial heat transfer equipment! If you have a hot or cold problem, look to Harrison for the answer!

**HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.**

**TEMPERATURES  
MADE  
TO  
ORDER**

**HARRISON**



# NEW! "magnamatic"...

## CONTROLLED TORQUE SCREWDRIVER-NUTRUNNER with the One-Shot Clutch

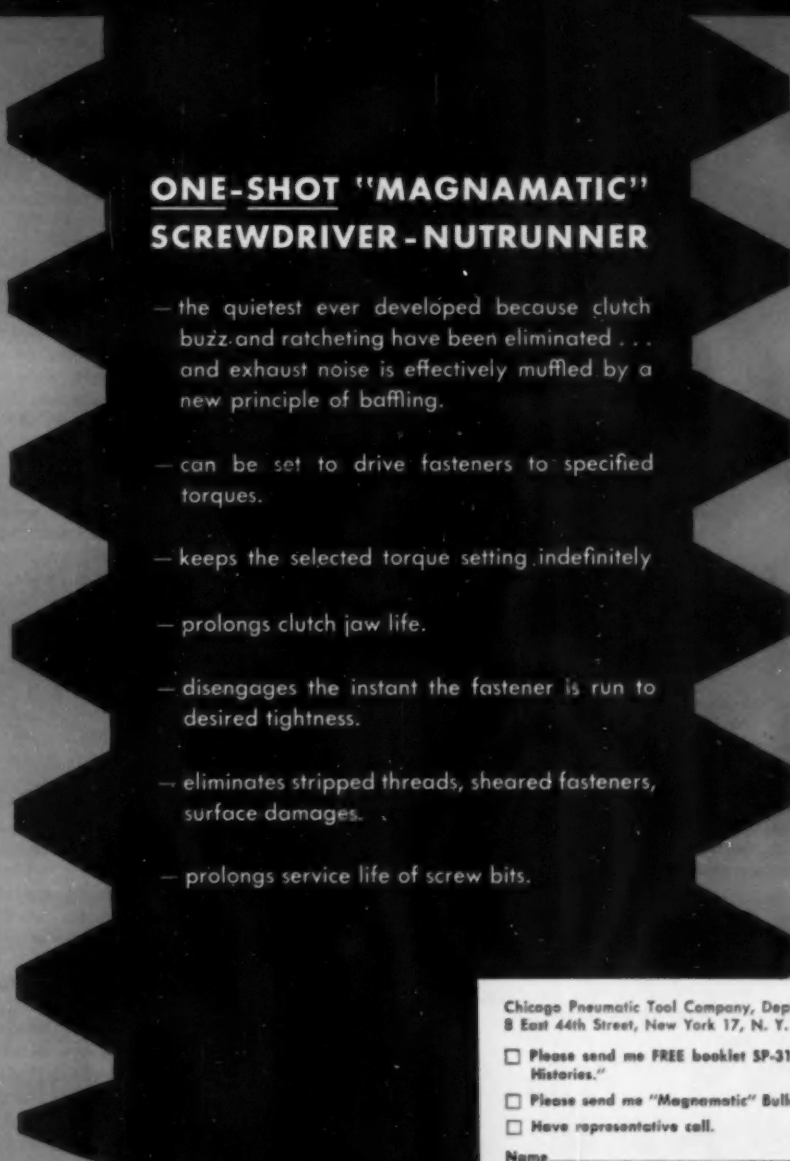
An air-driven torque screwdriver-nutrunner that can be set to run screws and nuts to specified torque—that's the CP One-Shot "Magnamatic." The Alnico magnetic One-Shot clutch, adjustable to specified torque, disengages completely the instant the fastener is driven to desired tightness. And "Magnamatic" is quiet—the clutch does not impact or ratchet. It maintains the selected torque setting indefinitely—prolongs clutch jaw life. Inexperienced operators don't burr screw heads, strip threads, shear fasteners, or damage work. Screw bits last longer.

CAPACITIES: #4 screws to  $\frac{3}{8}$ " bolts. Reversible and nonreversible types.



## Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



## **ONE-SHOT "MAGNAMATIC" SCREWDRIVER - NUTRUNNER**

- the quietest ever developed because clutch buzz and ratcheting have been eliminated . . . and exhaust noise is effectively muffled by a new principle of baffling.
- can be set to drive fasteners to specified torques.
- keeps the selected torque setting indefinitely
- prolongs clutch jaw life.
- disengages the instant the fastener is run to desired tightness.
- eliminates stripped threads, sheared fasteners, surface damages.
- prolongs service life of screw bits.

Chicago Pneumatic Tool Company, Dept. M-5  
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."

☐ Please send me "Magnamatic" Bulletin SP-3126.

☐ Have representative call.

Name \_\_\_\_\_ Title \_\_\_\_\_

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## Reynolds Plans to Enlarge Capacity by 270 Million Lb

Reynolds Metals Co. has announced plans to increase its primary aluminum producing capacity to 1.1 million lb. The bulk of the expenditures for new facilities, about \$200 million out of a total of \$230 million, will be devoted to the 270 million lb expansion of primary producing and related facilities. The remaining \$30 million will be spent under the program will be used for fabricating facilities, principally for the modernization and enlargement of present plants.

## Machining Aluminum Honeycomb

(Continued from page 55)

circulating warm air drying tunnel; standard milling equipment and vacuum facilities; special cutting tools; and thermostatically controlled warm water vats.

A new type of cutting tool was developed to machine the thin-walled cellular structures leaving a burr-free bonding surface. A special high speed steel was selected for fabricat-

ing the tool. Size, shape and cutter geometry were the result of an extensive research and development program to determine machining criteria and surface finish. Cutter diameters from  $\frac{1}{4}$  in. to 12 in. are used in machining both aluminum and stainless steel honeycomb core materials dependent upon the job requirements.

Unsupported aluminum honeycomb cores are machined without the aid of filler type materials such as plasters, resins, base metals, etc., usually used to fill the honeycomb cells prior to machining. Smooth bonding surfaces free of burrs are machined easily and economically requiring only the usual mechanical and technical skills of the machine operator and the processes as outlined. The following procedure should be followed:

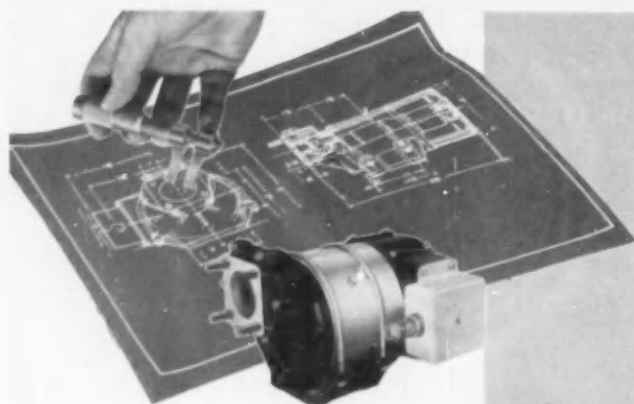
Inspect honeycomb material, rough or finish saw to size as tolerances will permit, and degrease. Degrease stainless steel holding plate, place on level layup table, apply adhesive tape dam to fit the honeycomb core, and fill the recessed area with sodium silicate (water glass) solution  $\frac{1}{16}$  in. deep. Tape should also be used where plate surface is to be used as a gage for indicating machined core surfaces. Place the honeycomb core blank in position on the plate, weight with shot bags, and set in circulating warm air tunnel to dry.

After drying, the plate and core assembly is inspected to assure the bond, then sent to the mill area for machining. Next, the bonded assembly is vacuum clamped in place on the machine table, secured with "U" clamps around the outer edges, special cutter placed in the machine, depth of cut indicated, and the core milled using the recommended speed and feed.

When the machining operation is complete, the assembly is removed from the mill table, and the machined surfaces are inspected for dimensional accuracy and plane of the cuts.

Upon completion of the inspection requirements, the bonded assembly is placed in a vat of warm water where the temperature is controlled at approximately 140 F until the sodium silicate adhesive has dissolved. Both plate and honeycomb core are rinsed in a second tank, removed, and allowed to dry in circulating warm air oven.

If further machining operations are required, the process is repeated.



### a motor designed to your exact product requirements

Many manufacturers of motor-driven products have found that the use of a Lamb Electric special application motor results in better products and lower costs.

Our high degree of specialization in both equipment and methods provides the advantages of custom manufacture on a volume basis. High quality and controlled costs go hand-in-hand.

We shall welcome the opportunity to demonstrate the benefits of a Lamb Electric special application motor for your products.

THE LAMB ELECTRIC COMPANY • KENT, OHIO  
In Canada: Lamb Electric —  
Division of Sangamo Company Ltd. — Leaside, Ontario



For motor-driven office equipment.



Aircraft pressurizing pump motor.

**Lamb Electric**  
SPECIAL APPLICATION  
FRACTIONAL HORSEPOWER **MOTORS**

# Why **KEPS®** save time...stay tight!



Loosening of ordinary nuts due to vibration is both dangerous and costly.



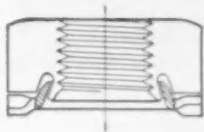
Lock washers are essential for most applications, but often hard to handle.



... except when nuts and lock washers are **PRE-ASSEMBLED ... as KEPS.**



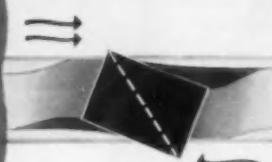
Then, awkward and costly separate lock washer handling is eliminated.



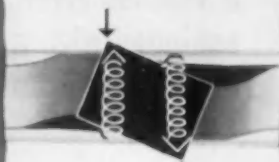
Nut and lock washer are mechanically pre-assembled as an integral unit.



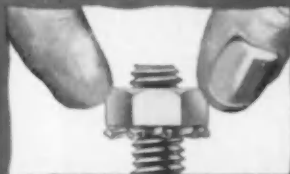
Shakeproof Lock Washers on KEPS lock tight because the teeth bite.



Tapered-twisted teeth bite deep to set up powerful resistance to any backward rotation.



Spring tension makes each tooth bite even deeper as vibration increases.



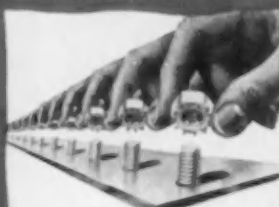
Starting KEPS is easier ... Free running action makes driving faster, saves assembly time.



Washers can't drop off, can't be wasted or "forgotten."



Standards and specials meet a wide variety of requirements.



With KEPS, you get tight, efficient fastening every time.

**Free  
Sample  
Kit**



Now ... make your own tests! See for yourself how KEPS can save time in the assembly of your product. Write for your free sample kit today!

## SHAKEPROOF



*"Fastening Headquarters"*®

DIVISION OF ILLINOIS TOOL WORKS

St. Charles Rd., Elgin, Illinois • Offices in Principal Cities  
In Canada: Canada Illinois Tools Limited, Toronto, Ontario

WORLD'S BROADEST LINE OF  
MASS-ASSEMBLY FASTENINGS



# Spicer

# BROWN LIPE *FULLY* Proved through 50 years

**The longest auto race that ever took place...round-the-world in 1908...was won by a Thomas Flyer equipped with a Brown-Lipe Transmission**



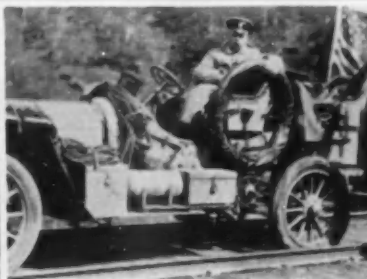
The race started in New York in February 1908, with 6 cars entered, and primitive road conditions were encountered right from the start.



In the race across the U.S. to Seattle, western gumbo and axle-deep water holes were conquered by unfailing Brown-Lipe transmission of power.



Shipped to Japan by boat, the sturdy Thomas Flyer once again started to blaze its own trails through roadless country.



Non-existent highways in Russia required travel far days at 10 miles per hour over ties of the Trans-Siberian Railroad.



After covering 13,000 land miles — 8,000 in low gear—the race ended in Paris 170 days later with the Thomas Flyer as the winner!



**—and a Parish Frame  
...another Dana product...  
assured an unyielding backbone  
of strength for the winning  
Thomas Flyer!**

**SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER**

# SYNCHRONIZED TRANSMISSIONS

## of the most rugged world-wide service !

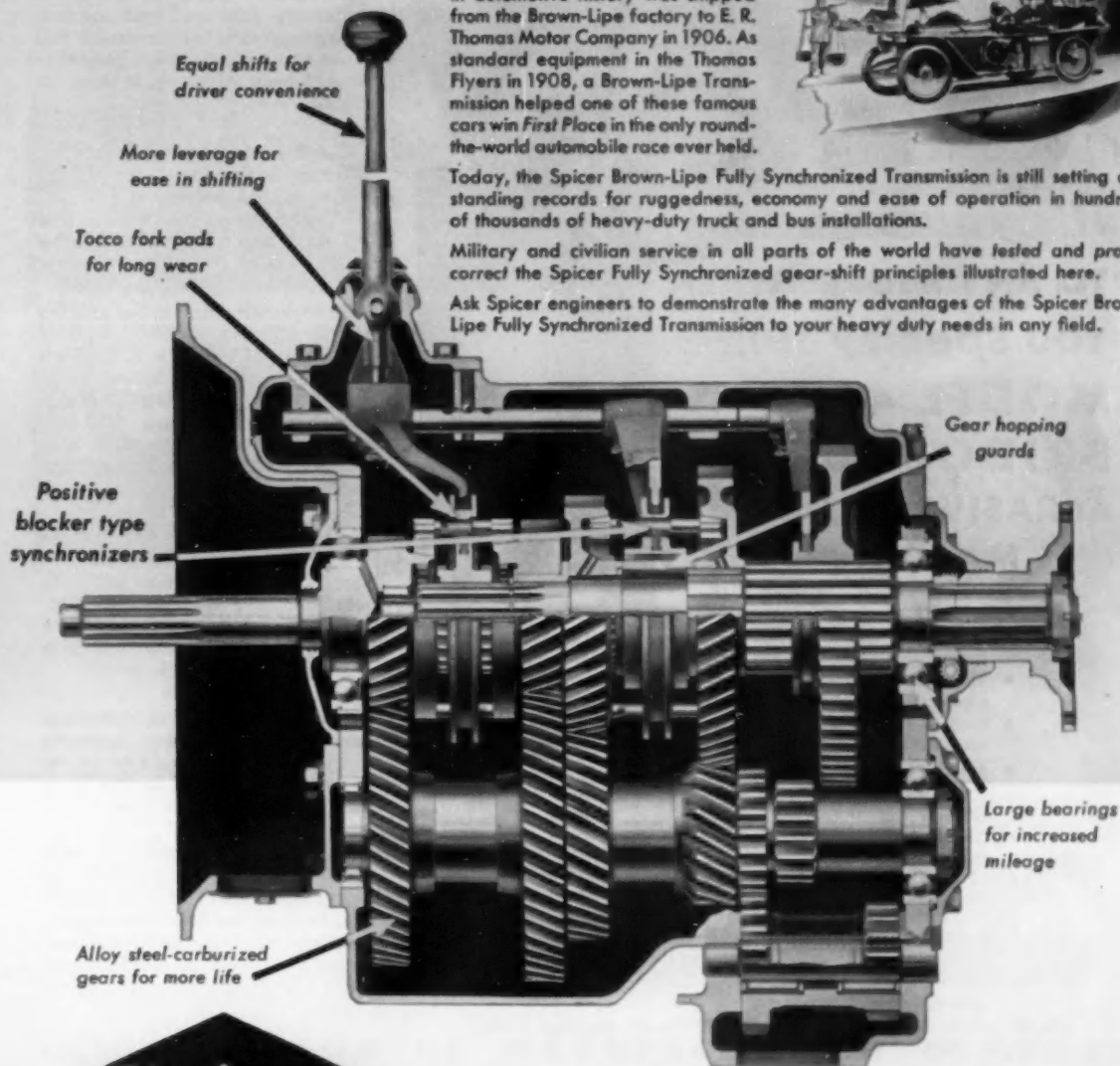


The first selective type transmission in automotive history was shipped from the Brown-Lipe factory to E. R. Thomas Motor Company in 1906. As standard equipment in the Thomas Flyers in 1908, a Brown-Lipe Transmission helped one of these famous cars win First Place in the only round-the-world automobile race ever held.

Today, the Spicer Brown-Lipe Fully Synchronized Transmission is still setting outstanding records for ruggedness, economy and ease of operation in hundreds of thousands of heavy-duty truck and bus installations.

Military and civilian service in all parts of the world have tested and proved correct the Spicer Fully Synchronized gear-shift principles illustrated here.

Ask Spicer engineers to demonstrate the many advantages of the Spicer Brown-Lipe Fully Synchronized Transmission to your heavy duty needs in any field.

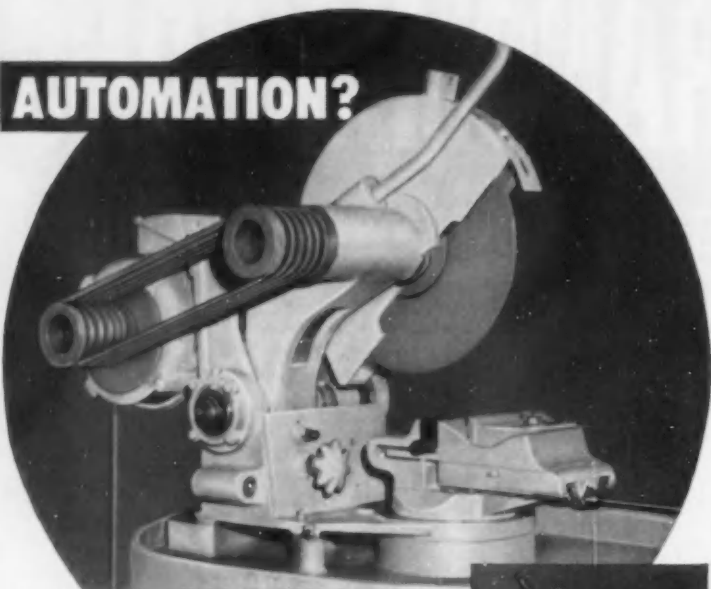


# Spicer

**DANA CORPORATION • Toledo 1, Ohio**

TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER AND AUBURN CLUTCHES • PARISH FRAMES

## AUTOMATION?



### it's yours TO ANY DEGREE WHEN YOU specify THIS **MODEL 48-W BRIDGEPORT ABRASIVE CUT-OFF MACHINE**

#### Here's why . . .

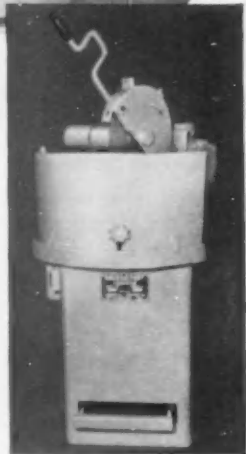
- Air cylinder and hydro-check actuates head . . . saves labor and reduces wheel costs. (16" dia. wheel).
- Vise operates by air cylinder . . . integrated head, vise operation is excellent safety feature.
- Feeding mechanism which grips material to be cut, moves it into position.
- A series of micro switches tie above operations into smooth cycle which repeats automatically.
- Stainless steel spindle with Grease Sealed bearings.
- Coolant applied equally to both sides of cut.
- Vise holds both ends of piece being cut.
- Abundant power supplied by 7½ H.P. motor.
- Swivel head for accurate angle cutting.
- Accurate counterbalance of head by location of motor.
- Heavyweight for long life and efficient operation.
- Complete automation produces close tolerances, increases production, saves labor.

LOBDELL has a complete line of BRIDGEPORT Cut-Off Machines to suit every need. Write for further details.

## LOBDELL DIVISION

UNITED ENGINEERING AND FOUNDRY COMPANY

WILMINGTON 99, DELAWARE



## ON OUR WASHINGTON WIRE

Mobilization officials are reviewing, one by one, fast tax amortization goals in a survey which will last well into the fall. In the meantime, Government will grant tax assistance for construction of only 20 types of new facilities.

Gross national product soared to a new high annual rate of \$385 billion in the second quarter of this year. Almost all elements of the economy are sharing in the boom.

Road construction in the months ahead will be spurred by the award of \$875 million in Federal funds to the states. Primary road systems are to receive \$315 million; secondary systems, \$210 million; urban extensions, \$175 million; and the interstate system, \$175 million.

Legislation geared to translate Hoover Commission recommendations into definite action will confront Congress at its next session. Nearly 200 bills on the subject will be taken up for action next January.

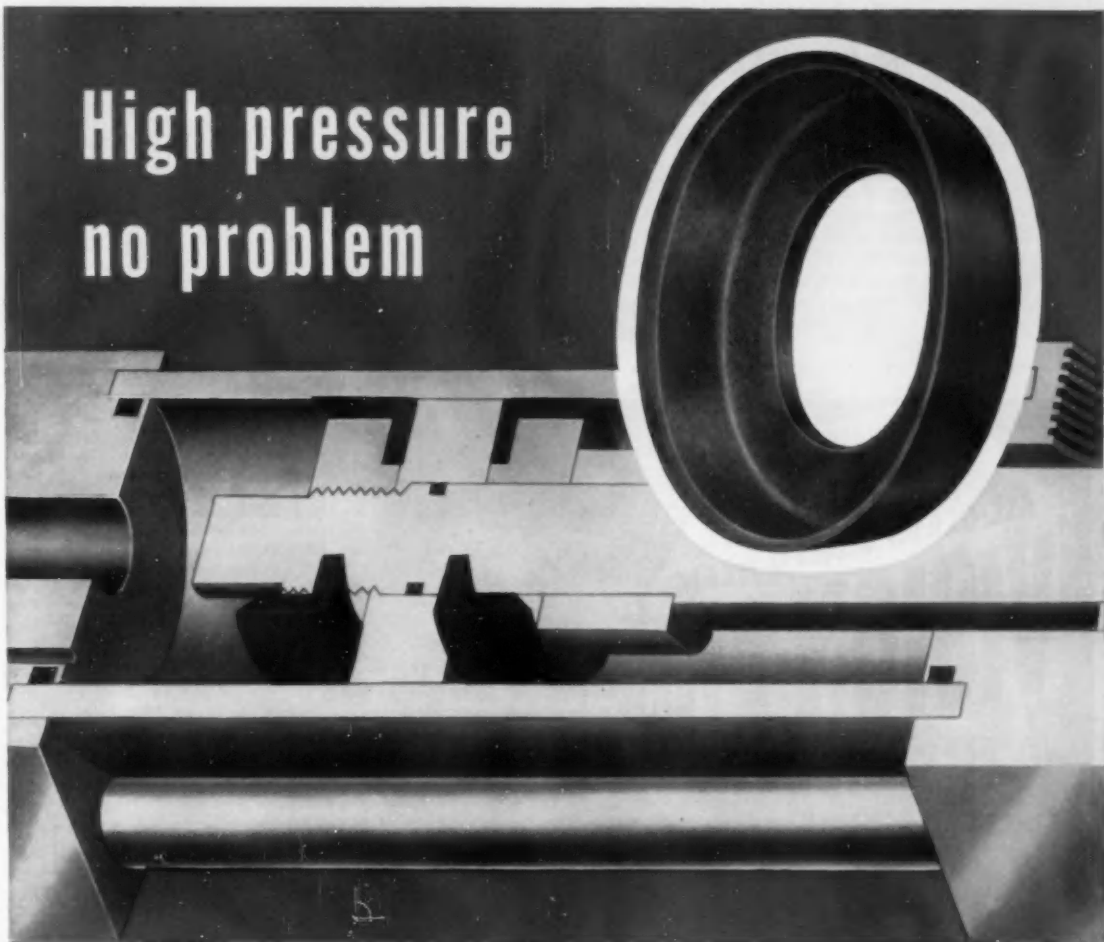
Toughening-up of government controls over business practices and advertising is said to be in the wind. First steps in the drive have already been taken.

A single bound volume containing results of the 1954 survey of manufacturers is now available to industry from the Superintendent of Documents (Washington 25, D. C.) or field offices of the Commerce Dept. for \$2.75 a copy.

Air Force insistence that new aircraft or guided missile production plants be built inland may be tip-off on a new long-range industry decentralization program.



# High pressure no problem



## SIRVIS-CONPOR PACKS IN A BIG PUSH

Got a high pressure problem? Maybe we can help. Chicago Rawhide's Conpor impregnated Sirvis leather packings are doing an outstanding job at pressures up to 10,000 psi. They are insoluble in most hydraulic fluids and are compatible with a wide range of other oils, solvents and gases. Sirvis-Conpor packings do not score cylinders, do not "chatter." The impregnations have no true melting point and will operate from as high as 225° down to -65° F. Sirvis-Conpor packings have high tensile strength, excellent resiliency, and operate without undesirable leakage. No other sealing material combines these advantages with long service life at such low cost. Let C/R engineers show you how to solve your hydraulic and pneumatic sealing problems with Sirvis-Conpor packings.



Send for "Report on Conpor." Write A. S. Berens, Chicago Rawhide Mfg. Co., 900 N. State St., Elgin, Ill.



## CHICAGO RAWHIDE MANUFACTURING COMPANY

1301 Elston Avenue SIRVIS DIVISION Chicago 22, Illinois

Other C/R products

OIL SEALS: Shaft and end face seals for all types of lubricant retention and dirt exclusion • SIRVENE: (Synthetic rubber) diaphragms, boots, gaskets, and similar parts for critical operating conditions • SIRVIS: Mechanical leather packings and related products.

## News of the MACHINERY INDUSTRIES

(Continued from page 83)

F. Roby as president. Mr. Roby has been a vice president and director of The Cincinnati Milling Machine Co.

For the six months ended June 30, 1955, Heald shipments amounted to \$9,700,000, and operating earnings, after taxes, are estimated at \$185,000. On August 1 the backlog of unfilled orders was \$11 million.



Gray iron dust at Ross Gear & Tool Co., Lafayette, Ind., created quite a problem until the three machines responsible were ventilated by one exhaust system. In this illustration two of the machines are shown under the exhaust hood. A cloth-filter collector, made by Wheelabrator Corp., traps the dust. The filter has 1918 sq ft of cotton cloth in the form of 168 tubes.

- Low beam up from 35 to 40 watts
- High beam up from 45 to 50 watts
- 23% more light on the low beam
- 26% more light on the high beam
- Up to 80 feet more distance with the passing beam
- Negligible glare-back in fog, rain and snow
- Less uncontrolled light to annoy oncoming drivers

**TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.**

Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Montreal (Canada), Newark, Philadelphia, Seattle

Nationally distributed for replacement purposes in this distinctive package.



Miniature Lamp

Sealed Beam Headlamps

Signal Flashers

Radio And TV Tubes

Aluminized Picture Tubes

Special Purpose Tubes

Semiconductors

### \$12,500 per worker

A very interesting report recently issued by Machinery and Allied Products Institute states that industry's investment per worker amounts to some \$12,500. Of this figure, \$4900 is for plant and equipment after depreciation. Just the plant and equipment phase of this investment costs industry \$25 billion per year for what the institute calls "wasting assets." Therefore, according to our current employment, it takes an average annual investment of \$450 per worker to maintain jobs already in existence.

MAPI conservatively estimates a 400,000 annual increase in the number of jobs. Thus, an additional \$5 billion in capital investment is required each year. Then, of course, our advancing economy, which is characterized by productivity gains, requires a continuous increase in investment per worker. The Institute estimates that this annual improvement factor requires an additional \$10 billion. Of course, in addition to the tools of production, the American worker shares in the business investment in working capital, such as inventories, receivables, cash and marketable securities.

### Each Year \$9 Billion

In the 10-year period, since the end of WW 2, private industry in the U. S. has purchased some \$90 billion worth of industrial machinery. In a

# ARO *Vision-eering Leads* IN OXYGEN EQUIPMENT



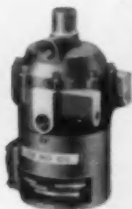
20 LITER CONVERTER



5 LITER CONVERTER

## ELECTRICAL TRANSDUCER GAGING SYSTEM

An IMPROVED means for measuring contents of Liquid Oxygen Converters... provides a continuous sight-reading of amount of liquid oxygen remaining in a converter.



## ARO Liquid Oxygen Converters save space and weight...

make one tank of liquid do the job of many tanks of gaseous oxygen! This important forward step in oxygen supply is another ARO first!

In the specialized sphere of oxygen equipment and components for high altitude flight... aviation looks to ARO for leadership!

ARO research and development have pioneered and perfected many of the new products to control the vital oxygen supply for the men who fly "way upstairs." Leading aircraft makers depend on Aro for a growing number of precision products. For further details write:

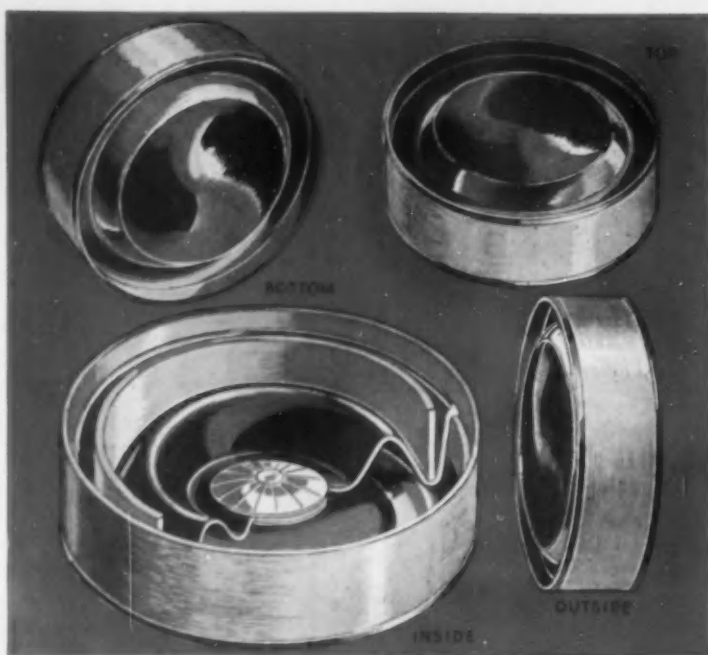
## THE ARO EQUIPMENT CORPORATION BRYAN AND CLEVELAND, OHIO

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# ARO

## AIRCRAFT PRODUCTS

Liquid Oxygen Converters, Oxygen Regulators, Pressure Regulators, Contents Gauges, Relief Valves, "Anti-G" Valves, Air and Oxygen System Accessories, Actuating Cylinders and other Aircraft Accessories.



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has definite advantages in both  
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As shown here, the product packaged is a 10" diameter synthetic rubber diaphragm or bladder used in aircraft hydraulic accumulators. The pack is designed to eliminate distortion.

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survey made by CIT Corp., industrial growth in the last decade was 4½ times as great as in the 12-year period from 1929 to 1941. Of the total figure, \$8½ billion has been spent for metal-working machinery by private industry in the last decade.

## Merger OK'd by NBP Stockholders

According to L. D. Silberstien, chairman and president of Penn Texas and Niles-Bement-Pond, well over three-quarters of the Niles shares were voted in favor of the merger with Penn Texas. Penn Texas stockholders vote on the merger Sept. 15.

## Switch to Propane

(Continued from page 98)

valve of a gasoline carburetor minus the metering jets and needle valves required for gasoline.

Tanks are changed about every day and a half. The lift truck operator closes a fuel control valve on the tank, unhooks a mounting strap, and uncouples the fuel line, then removes the empty container and hooks up a full one. The whole job takes less than two minutes. Twelve tanks are kept in reserve to supply needs between visits of the propane supplier, who calls about once a week and replaces empty containers with filled ones.

## BOOKS . . .

**AUTOMATIC CONTROL BIBLIOGRAPHY**, by Warren F. Wade and Emory N. Kemler, published by Summary Reports, Box 176, Spring Park, Minn. Price, \$15.99. This bibliography summarizes American and English literature relating to the automatic control field, primarily for the period since 1900. Each listing contains a very brief abstract of the type of material contained in the article. Arrangement of literature is alphabetically by authors and alphabetically by magazines for those articles for which the author was not shown.

**HOW TO BUY A USED CAR**, by J. M. O'Shea, published by Shore Publishing Co., Inc., 16 East 42nd St., New York, N. Y. Price, \$1.00. This pocket-size, easy-to-carry book shows the prospective buyer exactly how he can find out if the car he is considering buying is in good condition. Fifty-five inspections and tests are arranged in list form so that each can be checked off as it is made. In addition, the book gives the shopper hints on how to decide what make, model and year he wants, and provides instructions on how to avoid unnecessary expense in paying for the car once he has bought it.

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*A HELIARC HW-13 torch  
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A West Coast aircraft plant is using mechanized HELIARC welding to join the components of aluminum sealing covers for radar units—the "Seeing Eyes" of the Armed Services. Welding time has been cut from one hour and 10 minutes to only six minutes and the plant now turns out eleven covers in the same time it had formerly taken to produce one. Because the HELIARC welds are shielded from contamination by an inert gas, such as argon, they require no flux and are free from porosity and oxide inclusion. This results in fewer rejections and a minimum of finishing.

LINDE's team of welding processes—HELIARC, sigma, and UNIONMELT welding—can help you cut production costs and increase quality. Whatever your welding problem—one of LINDE's electric welding processes can do the job efficiently and economically. Call your local LINDE representative today for more information.

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THREAD ROLLING HEAD

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AS A ROTATING HEAD — Resetting mechanism is operated by a yoke, with handle removed.



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makes more of your  
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the same head  
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## AIRBRIEFS

(Continued from page 98)

shipped by seven manufacturers at a total billing price of \$36,148,000. Piper Aircraft Co. leads the group for June deliveries with 224. Cessna is next with 188 and Beech third, having made 73 deliveries.

### High Speed Company Transports

Lear, Inc. of Santa Monica, Calif. found an expanding market for its specially built, deluxe, speedy, long-range twin engine executive transport plane. Last month the Burroughs Corp. of Detroit took delivery of a Learstar and United States Steel Corp. placed an order for two of them.

Since the Learstar was approved by the Civil Aeronautics Administration as a certified air transport in January this year, production Learstars have been delivered to such purchasers as British American Oil Co., Ltd. of Toronto, Canada; Chance Vought Aircraft, Dallas, Tex.; Charles B. Wrightsman of Palm Beach, Fla.; and Johnson & Johnson of New Brunswick, N. J.

The Wrightsman Learstar recently made a 2570 mile non-stop flight from Gander, Newfoundland to Paris, France in eight hours and fifty minutes.

### Busiest Airtraffic Center

New York City (including Newark) leads the nation in air traffic for 1954, according to the Aircraft Industries Association. Figures are compiled showing the number of aircraft departures and number of passengers for the leading three cities, and passengers only for the other cities.

| City             | Aircraft Departures | Passengers |
|------------------|---------------------|------------|
| 1. New York      | 127,823             | 3,836,634  |
| 2. Chicago       | 120,234             | 3,044,545  |
| 3. Washington    | 78,524              | 1,509,963  |
| 4. Los Angeles   | .....               | 1,478,948  |
| 5. San Francisco | .....               | 1,131,004  |
| 6. Detroit       | .....               | 891,863    |
| 7. Miami         | .....               | 886,456    |
| 8. Atlanta       | .....               | 853,968    |
| 9. Boston        | .....               | 710,964    |
| 10. Dallas       | .....               | 688,695    |
| 11. Cleveland    | .....               | 688,096    |

### Safety Record for Non-Skeds

Forty-three U. S. non-certificated independent airlines flew approx-

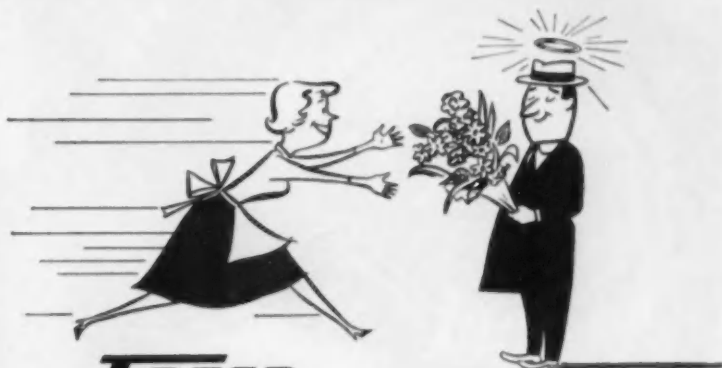
imately 1,300,000,000 passenger miles in 1954 without a crew or passenger fatality in domestic and international operations, according to the Aircoach Transport Association.

Much of their work is flying military personnel and freight on a contract basis. For military flights a control board is maintained in Washington by the ATA to record movements of the planes of member companies in order to minimize ferrying of empty planes between runs. They are about to expand this service to include civilian passenger flying.

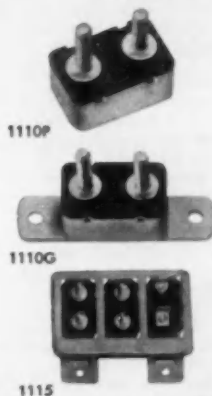
### Advanced Research Division Established

Hiller Helicopters of Palo Alto, Calif., has broken ground for a new research division facility. According to its president, Stanley Hiller, the Advanced Research Division is to provide proper facilities for the increasing emphasis now being placed on all types of research in the vertical take-off field. Last spring the Hiller Co. announced its development of the flying "manhole cover."

(Turn to page 152, please)



## FASCO AUTOMATIC RESET CIRCUIT BREAKERS



### STOP TROUBLE BEFORE IT STARTS!

Instantly... automatically... without fail... these Fasco products protect electrical circuits from overloads and shorts... safeguard the operation of low-voltage electrical equipment. Available in 8, 10, 15, 20, 25 or 30 ampere capacities... for mounting in 1, 2, 3, 4 or 8-unit FASCO brackets.

When it comes to circuit breakers, the automotive industry has found that it pays to **CONSULT FASCO... FIRST!**

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Ask for interesting, illustrated bulletin.

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**SPUR GEARS**—Straight, helical, and internal. Sizes from 16 pitch, 1½" dia., to 1½ pitch, 36" dia.

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**SPLINED SHAFTS**—Lengths to 52". Diameters from 1" to 6".

**DIFFERENTIALS**—10,000 to 300,000 inch pounds capacity.

Note: All sizes above are approximate.

**FAIRFIELD  
MANUFACTURING CO.**



2303 SOUTH CONCORD ROAD • LAFAYETTE, INDIANA

(Continued from page 151)

## Sperry Rand Corporation

A giant of the aircraft instrument field has joined in corporate structure with a giant of the business industry.

The Sperry Corp. and Remington Rand, Inc. have consolidated to form "Sperry Rand Corp." This combination consolidates several rather diversified fields of activity—those of Remington Rand in office machinery and equipment, furniture, electric shavers, computers, etc., with those of Sperry in precision instruments and controls, farm machinery, electrical and hydraulic equipment and automatic machinery.

## BOOKS...

**TARIFFS: THE CASE FOR PROTECTION**, by Lewis E. Lloyd, published by Devin-Adair Co., 23 East 26th St., New York 10, N. Y. Price, \$3.50. Tariffs and world trade are perennial issues and they receive special emphasis from time to time. Now is one of those times—perhaps the most important—because of our increasing world leadership. Much has been written against tariffs, but here—in one of the few "protection" books ever written—Dr. Lloyd gives sound reasons for tariffs. Originally an avowed "free trader," the author here gives the results of two years' research which changed his own convictions. He surveys the tariff issue from its origin in 1791 and pins it down to all its far-reaching effects on wages, production, technical progress, and national defense. He also shows how and why our internal economy must be supported and protected by tariffs.

**AUTOMOTIVE ENGINES**, by William H. Crouse, published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, \$6.50. This volume, the first in a new automotive series, gives complete and comprehensive information on the construction, operation, trouble shooting, servicing, and repair of the modern American automobile engine. A great deal of newly developed information on the causes and cures of engine trouble and recent advances in the field have been included. Complete chapters are devoted to the following topics: fundamental principles; automobile components; engine fundamentals; engine performance measurements; engine types; engine construction and components; pistons and valves; automotive engine fuels and fuel systems; automotive engine cooling systems; automotive lubrications and lubricating systems; engine testing procedures and tools; and engine diagnosis.

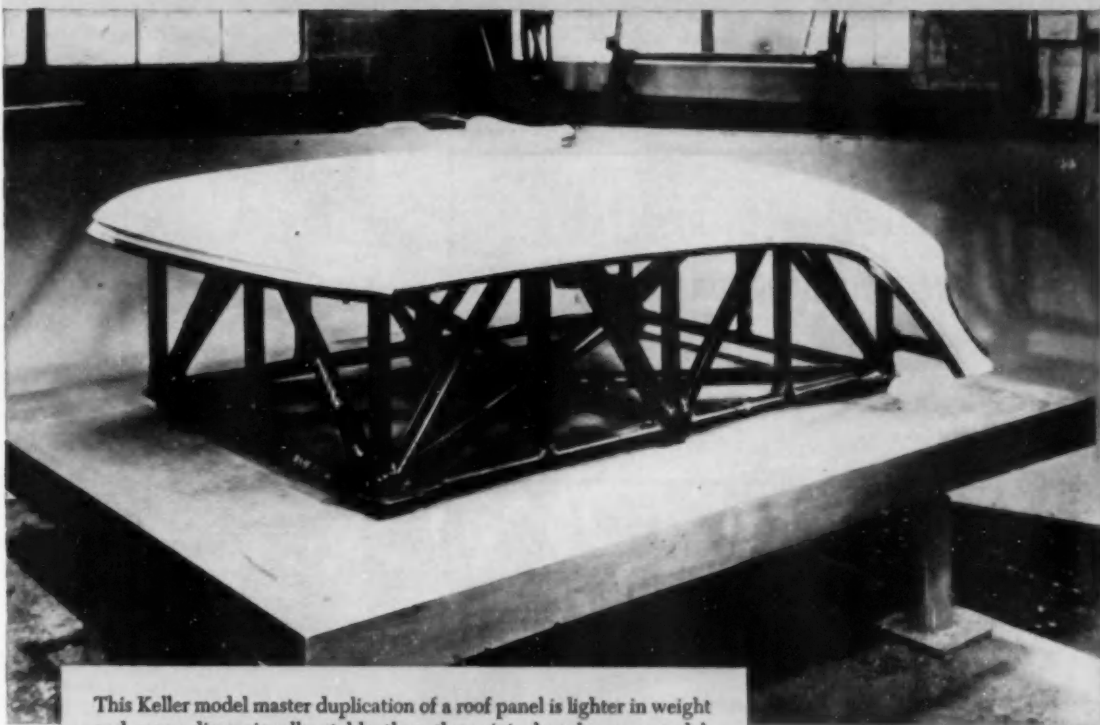
**ASTM STANDARDS ON PETROLEUM PRODUCTS AND LUBRICANTS**, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$6.65. This special compilation of specifications, indexes, and definitions covering petroleum products and lubricants provides in compact readily usable form the ASTM standards in this field. The 1955 edition gives in their latest approved form over 100 test methods, numerous specifications, and lists of definitions of terms relating to petroleum. Several appendices are included covering proposed tests of jet fuels, steam turbine oils, and aviation fuels.



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TRADE-MARK



This Keller model master duplication of a roof panel is lighter in weight and more dimensionally stable than the original mahogany model. It's made from plastic tooling compounds based on BAKELITE Epoxy Resins and produced by Ren-ite Plastics, Inc., Lansing 4, Mich.

**M**etalworking tools cost less when they're made with BAKELITE Brand Epoxy Resins. Compared with conventional materials, these compounds offer quick, easy production, plus these advantages:

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For more information, write Dept. JZ-4.



**BAKELITE COMPANY**, A Division of Union Carbide and Carbon Corporation **UCC** 30 East 42nd Street, New York 17, N. Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

# SOVIET SYSTEMS . . . for Design and Production of Aircraft

(Continued from page 65)

The basic or "frame" aggregates of the first group include the fuselage, wings, wing center section (if one exists), tail empennage, landing gear (wheels, floats, or skis), and the power plant installation. The remaining aggregates of the second and third groups, called the "stuffing" of

the frame, are for the most part finished and independently installable aggregates.

The aggregation of the frame element of the aircraft can be of two types: "design" aggregation, and "production" aggregation.

By design aggregation is meant the

dismemberment of the machine into adjoining aggregates, which must be quickly and easily dismountable and, if necessary, replaceable. In the moving elements, such as flaps, ailerons, air brakes, etc., design aggregation is directly based on the function of the given aggregate. In non-moving elements, such as parts of the fuselage and wing, design aggregation is determined by the accepted design solution.

By production aggregation is understood the dismemberment of the plane into elements capable of being manufactured as independent objects of production, which are then assembled with the use of permanent or semi-permanent fastenings to form a finished, non-dismountable aggregate.

The earlier used method of assembling the chief aggregates of the plane (fuselage, wing, wing center section) directly from parts in large and complex docks has now practically been abandoned. At the present time the so-called "section" and "panel" method is used; i.e., the further dismemberment of the basic aircraft aggregates into more or less complex sub-assemblies. These assembled sections and their panels are then assembled into aggregates. Sectioning and panelling permit the simultaneous fabrication and assembly of the constituent parts of aggregates, using relatively simple docks and jigs.

Sectioning and panelling, which is a logical extension of technological aggregation, outgrows its technological functions in its development and often determines the nature of the plane's design. By a well-conceived system of aggregation, designers can facilitate the modification of machines and may considerably increase the term of use of individual aggregates, sections, and panels. In this way their production is stabilized and the organization of production simplified. For this reason the analysis and description of aircraft designs at the present time is usually conducted in terms of aggregates.

The PO-2 (U-2), designed by the Hero of Socialist Labor N. N. Polikarpov, is an example of a more successful design and aggregation, created long before this method had been scientifically grounded and in-

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troduced into practice. This aircraft began to be produced serially in 1927 as a trainer and is still used at the present time, having outlived its creator (Polikarpov died in 1944). This rare instance of longevity in a plane design (almost 30 years) is explained, for the most part, by its successful design solutions which permit the plane to be relatively easily modified, the simplicity of its manufacture, its good operational qualities (servicing, repair) and its good flight characteristics. The PO-2 is used not only as a basic trainer, but also as a passenger, transport, mail, liaison, agricultural, geological survey, forest conservation, and aerial photographic plane. During the Second World War it was used as a light night bomber, an artillery fire directing plane, a medical, passenger, transport, and freight plane with a suspended freight adapter.

The principle of aggregation places a great responsibility not only on the designer of the airframe, but also on the designers of the other aggregates ("fillers") entering into the make-up of the plane. A typical distribution of the flight weight of a single-seat Soviet plane according to the design personnel is as follows:

|  |        |
|--|--------|
| Weight of aggregates, designed by the plane's designer | 30-40% |
| Weight of aggregates, supplied by other plants         | 45%    |
| Other: weight of fuel, oil, pilot                      | 15-25% |
|  | 100%   |

As mentioned earlier, the principle of aggregation has considerable influence on the organization of production, determining the possibility of using more modern methods of production, including the possibility of a complete transition to the flow system of production. The attainment of fully interchangeable aggregates, sections, and panels, and their constituent parts, permits the organization of the production of aggregates and their elements in isolated, but self-contained areas closely tied to the general flow of the basic aggregate.

With interchangeability the assembly time of the finished aggregate and the costs for the general assembly of the aircraft are cut to a minimum. This consideration is especially important for aircraft construction, as it is distinguished from other forms of machine building and, in particular, from engine building by its large amount of assembly work and by the fact that the assembly work is combined with a large number of processing operations such as drilling, reaming, welding, riveting. Aggregation and interchangeability



## How Holley's rolling laboratories test the fuel metering devices for tomorrow's cars and trucks



When a carburetor prototype or an important design change has proven its merit at Holley's "inside" research lab, it's sent to the world's toughest proving ground—the streets and highways of America.

Holley's inside research and development laboratory—one of the best equipped in the automotive industry—can tell only part of the story. Cold room, dynamometer, and air box testing simulate to a high degree the driving conditions a carburetor prototype will ultimately face. Even before these physical tests, an electronic computer—Holley acquired one of the first in the automotive industry—checks and tabulates design theory from drawing board specifications.

But ultimately, the most conclusive test is found on city streets, country roads and super highways.

Holley engineers frequently average 500 miles a day for ten days measuring a carburetor's performance in heavy traffic or on super highways.

The results of this concentration on research both "inside" and "outside" have helped to bring Holley equipped cars 5 sweepstakes champions in Mobilgas Economy Runs and 3 straight Heavy Stock Car winners in the fabulous Pan American Road Race.



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HALF A CENTURY  
—ORIGINAL EQUIP-  
MENT MANUFAC-  
TURERS FOR THE  
AUTOMOTIVE IN-  
DUSTRY.

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permit the attainment of a minimum of machining and adapting operations in the general assembly of the aircraft. Smaller sub-assemblies permit the use of simpler, less expensive jigs and more productive equipment. The need for assembly workers to operate in cramped and difficult positions is minimized. That this factor can have a large effect on productivity is attested by the fact that it may take a worker as much as two and a half times as long to perform one riveting operation in a prone position

as it would in a standing position.

Other factors being equal, the system of aggregation, sectionalizing, and particularly of panellizing reduces the amount of production floor space required for over-all assembly while increasing that needed for sub-assembly operations.

In short, the advantages derived from breaking down a design into composite sub-assemblies include: (1) an increase in quality; (2) a reduction in production cost through reduced labor and floor space require-

ments and shorter production cycles; (3) higher labor productivity; (4) increased output; and (5) the facilitation of work-rate norming to the point where it is similar to norming work on machine tools.

However, in view of the obstacles to efficient organization described above, it may be concluded that the achievements of individual designers and plants in the introduction of the progressive principles of aggregation, interchangeability, and the continuous flow organization of production will not be so rapidly attained by the whole Soviet aircraft industry.

Practically no information is available concerning the extent of rocket and jet engine development in the USSR. Other than the German scientists imported to work in these fields, only a few Russian engineers are identified. The evidence thus far presented indicates a general shift from piston to jet engine production and at the present time piston engines probably are in general use only for relatively slow transports and passenger planes.

The table presented here—"Characteristics of Soviet Jet Aircraft Engines"—contains the latest data obtainable.

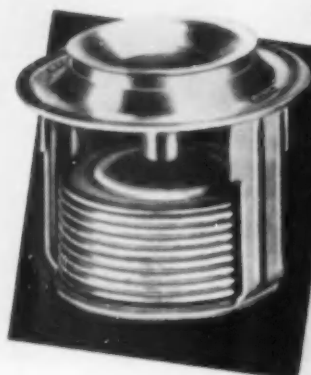
The history of Soviet aircraft plants shows a clear tendency toward the adoption of the higher and more complex system of production organization. In the early 1930's the Soviet aircraft industry used the shop form of production; in the second half of the decade the industry changed to the group form of production. By the beginning of World War II, most of the aircraft plants were working on the flow system, with only a few having achieved a continuous flow organization.

There is little information available on the wartime system followed by the Soviet aircraft industry, but it is likely that at least by the end of the war the flow system of production was being used in most plants.

In the postwar period there was a noticeably clear tendency in all Soviet serial machine building plants to convert to the continuous flow system. It may be logically assumed, therefore, that the majority of serial production plants of the aircraft industry are tending toward the continuous flow system. Since this conversion presents considerable difficulties, however, the most widespread system at the present time is in all probability the flow system, with a more or less widespread use of transporters for transferring products from one work

## A Big Plus For You With Flexon Thermostats

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THERMOSTATS**  
utilize Flexon  
Instrument Bellows—  
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to provide  
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T-26

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# How the use of NATIONAL Seamless EXTRUDED

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*cuts not manufacturing costs*

USING NATIONAL Seamless EXTRUDED USS Stainless (type 303) Tubing, the Tri-Clover Division of Ladish Corporation is now turning out hexagonal nuts in less time and at lower cost than they could using solid bar stock. The savings in material cost alone amounts to 11.77 cents per piece.

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NATIONAL EXTRUDED Tubing offers you high strength, uniformity, and dependability that only *seamless* tubing can give. For a better precision part, involving fewer operations and fewer machine hours, investigate NATIONAL Seamless EXTRUDED Tubing—made by the world's largest manufacturer of tubular steel products. Feel free to call our engineers if you'd like help in applying NATIONAL Seamless to your product.

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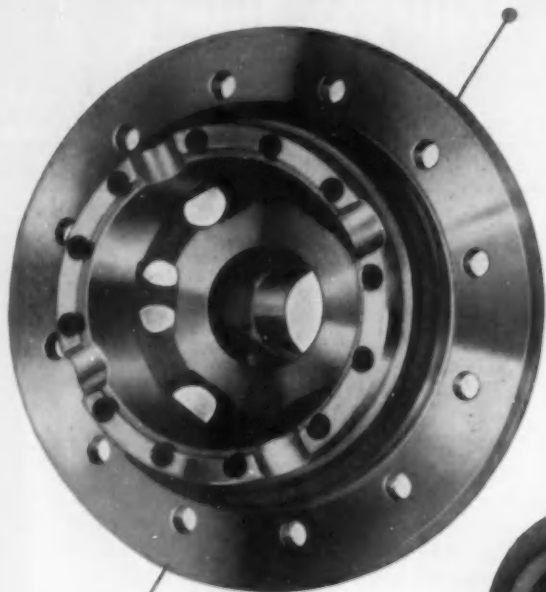


### NATIONAL Seamless EXTRUDED TUBING

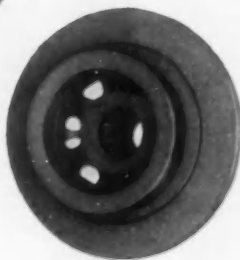


UNITED STATES STEEL

# MACHINABILITY INDEX 80-90\*



## PEARLITIC MALLEABLE CASTINGS



\* B1112 STEEL = 100

Low machinability index of 80-90 (B1112 steel = 100) is probably reason enough to warrant serious consideration for your product.

But pearlitic malleable castings—from National—don't stop there. They have great ultimate strength . . . resist wear under heavy loads at high speeds . . . make excellent non-seizing bearings . . . can be air or liquid-quenched . . . can be smooth-finished.

Don't overlook the advantages of pearlitic malleable. For pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase the sales potential of your product.

AA-1005

## NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

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The Nation's largest independent producer of malleable and pearlitic malleable

position to another and conveyors for assembly work.

The great advantages of the continuous flow system have induced the management of the Soviet aircraft industry to attempt to convert all aviation plants to this system. But this is not always feasible. Specific features of Soviet conditions present serious difficulties to the introduction of progressive, up-to-date methods of production.

The most important of these obstacles are:

1. The very low level of motivation for industrial workers (from the shift foreman to the director) to introduce new methods of production which are more complex, organizationally and technically.

2. The fear of introducing new methods due to the fact that output may be lowered in the adjustment period and the plan underfulfilled, which, as is well known, brings serious consequences to the responsible parties.

3. Fear that in the case of failure there will be accusations of wrecking, sabotage, economic counter-revolution, etc., with all the consequences ensuing therefrom.

4. The lack of highly qualified politically reliable cadres, even though in the aircraft industry only politically reliable persons (from the Soviet point of view) are chosen. As a rule, highly qualified specialists are not completely reliable politically, while completely reliable specialists are not sufficiently qualified.

5. The extremely complex, burdensome, and unwieldy bureaucracy which interferes with the rapid and efficient introduction of new methods.

6. The extraordinary secrecy which inhibits exchange of information and experience, particularly in the defense industries.

The lower average productivity of Soviet workers in comparison with English, German, and especially American, has forced the Soviet government to resort to the Stakhanovite system; i.e., a series of measures which lead in the last analysis to the maximum loading of the work period and to the establishment of piece-rate norms of output on the basis of the work of the best workers operating under especially-created favorable conditions. The so-called Stakhanovite methods have also been introduced into the aircraft industry.

Chaos and blunders are introduced in the organization of production by the activities of what is referred to as "the light cavalry." Normal production after a raid can be more or



*at your fingertips*

**BIG**

# NEWS ABOUT SMALL ELECTRIC MOTORS

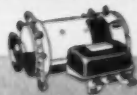
For the increasing number of applications on today's new vehicles, American Bosch provides a wide variety of small, high-torque electric motors engineered for quiet power and sturdy dependability. Trouble-free performance is assured by famous American Bosch quality and precision, widely known in the original equipment field. If you have one or a number of small motor requirements in your designs, put the problem up to American Bosch, Springfield 7, Mass. A Division of American Bosch Arma Corporation.

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**Automotive and  
Aviation Magnetos**



**Generators and  
Regulators**



**Components for  
Aircraft Engines**



**Small  
Electric Motors**



**Electric  
Windshield Wipers**



**Diesel Fuel  
Injection Equipment**

less restored by the engineers, planners, and other organizers only with great effort.

The usual state of the organization of production in one of the best air-frame plants, the *imeni Gorbunov*, is well illustrated by the following example: The chief production engineer is not concerned with the determination of the capacity of the production shops of the plant. The layout of equipment in the shops is carried out *by eye* . . . The situation with the mechanization of assembly

work is no better. The plan for the mechanization of a series of aggregates is not being carried out. Most of the dies designed by the technological department either have not been prepared, or if prepared, have not been introduced. . . . In the shop, rejects are systematically blamed on the "organization of production," and not on specific guilty persons, as was intended by the law. . . . In the [assembly] shop the existence of the so-called "defect brigade" (18 men led by a foreman) was legalized.

This brigade is concerned only with the repairing of rejects in the last operation [assembly]. These rejects arise as a result of incompleteness or disruption of the production plan in individual sections. The number of defects repaired on one of the aggregates ranges between 60 and 110. The maintenance of this brigade costs the plant tens of thousands of rubles.

A characteristic which seriously interferes in the efficient working of any system of organization is the exceptional secrecy in the aircraft industry. In the non-military sectors of the economy, Soviet laws carry severe punishments for "revealing state secrets"; from 5 to 20 years in corrective labor camps.

In the defense industry and in the aircraft industry, the security classifications have been worked out in greater detail and defined by special orders of the Minister of Aircraft Industry, and, further, by the directors (chiefs) of plants and institutes. The tendency towards secrecy, arising from the fear of being accused of revealing state secrets, has led to the fact that in TsIAM, for example, every drawing, even of individual parts, is stamped "Top Secret."

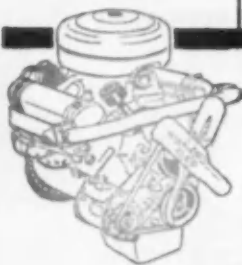
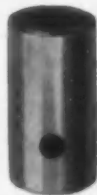
The reasons for such inefficient organization of production lie at the very heart of the Soviet system and are an organic, intrinsic part of it.

In the personal opinion of the author, who worked more than 20 years in Soviet industry, and who has closely followed postwar industrial developments in general, the organization of production is developing more slowly in the postwar period than is technical and technological progress.

The increase in output in the plants of the aviation industry (as well as in other enterprises) is due, for the most part, to extravagant expenditures of labor, materials, equipment, and, perhaps, mostly of the nervous energy of workers.

On the basis of the above, the author suggests that Soviet aircraft plants in the past 15 years (1940-1955) have undergone less changes in the organization of production than have aircraft plants in the United States.

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*keep pace with today's engines*

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration.

Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance.

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**AUTOMOTIVE INDUSTRIES . . .**

*is your News Magazine of Automotive and Aviation*

**MANUFACTURING**



*"Comparison  
converted me to*  
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**For butane conversion,  
they stay on the job  
when the going gets rough!**

This is the typical attitude of careful buyers who are converting truck or bus fleets to butane. They compare *all* shutoff valves, and conclude correctly that none can touch the famous General Controls PV Series.

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So to make sure you get all the advantages of butane conversion—compare *before* you buy. From the standpoint of cost—or for the grit to take it when the going gets rough—you'll find General Controls puts you "out front" on the heavy-duty hauls.

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**General Controls  
PV Series**

**BUTANE  
*Shutoff*  
VALVES**



**PV-1C  
Gasoline  
Shutoff  
(10 psi)**

**PV-1C  
LP-Gas  
Shutoff  
(300 psi)**



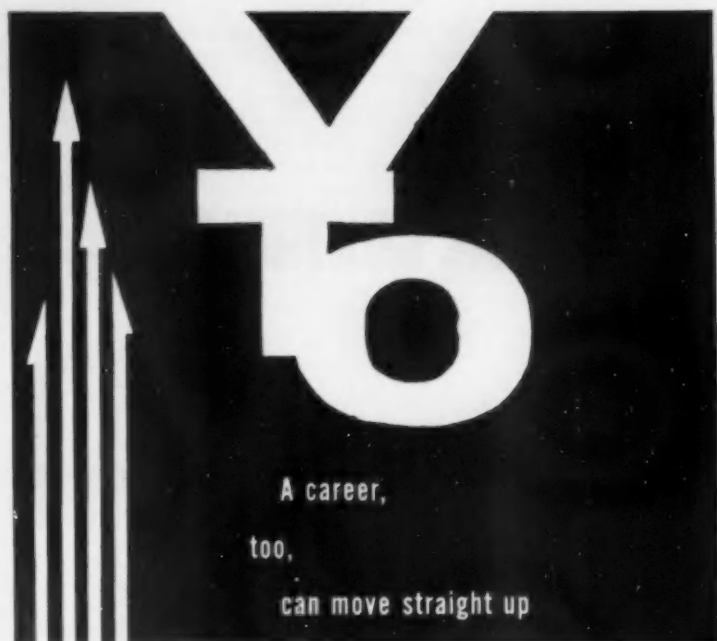
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*"where the future is  
measured in light-years"*



## Industry News

(Continued from page 106)

### Ford Aids Mexican Drive To Use National Products

The Mexican assembly plant of Ford Motor Co. is seeking larger supplies of Mexican-made materials. This is in keeping with the company's policy of aiding in the development of nationally produced goods.

At the present time, tires, batteries, springs, chassis for trucks, screws, and other small parts are already being made in Mexico. The current drive is aimed at 100 per cent national production of all items needed.

The Ford assembly plant is now said to be producing more trucks and buses than any other operating in Mexico. Ford is also starting production of tractors in Mexico for the first time.

### GM 'Parade of Progress' Hits Attendance Record

General Motors broke an attendance record with its Parade of Progress traveling science show in Montreal, Canada. During its 5½-day run in that city, the show attracted 312,135 persons, nearly double the previous attendance record set in Boston during the same number of days.

Designed to emphasize the importance of industry in every-day life, the GM show has been seen by more than five million persons since it went on tour in April, 1953. The show came back to the U. S. on Sept. 3 when it opened at Green Bay, Wis.

### Leece-Neville Given Contract For High-Capacity Generators

Leece-Neville Co. has been awarded a \$1.5 million Ordnance contract for high-capacity generating systems. They will be used principally for wheeled vehicles. Said to be four times more powerful than similar equipment now used, the generators will furnish Ordnance vehicles with additional power for a number of applications, especially for radio equipment.

### Automotive Parts Sales Headed for New Record

The automotive replacement parts market this year appears headed for an all-time record. Estimate by one of the automobile companies is that industry-wide parts sales this year will total about \$2.25 billion.

# S.O.S.

*Sign of Superiority*

Symbol of nationally recognized leadership in spring and diversified wire products of superior quality for American Industry.

... Also a major producer for the Armed Services.



**L. A. YOUNG**—serving the nation  
through 15 strategically located plants  
Main Offices: 9200 Russell Street, Detroit 11, Mich.

## Future Uses of Titanium

**T**ITANIUM, seemingly set for a major military role a few years ago, may have a promising future in civilian use.

One possible industrial application of the light, strong metal is in plating and anodizing racks. Chemicals producers may someday require considerable amounts of the metal. Just getting started are experimental pro-

grams for making some of it into nuts, bolts, and other fasteners.

Continuing as the heavy user of titanium, though, is the aircraft industry. Government men working with the utilization programs figure plane builders take about 95 per cent of the output. A sizeable portion of the 1956 production will be steered into jet engine plants.

Total weight of the sponge output this year is to be about 8000 tons. That amount is small, but the quality is improving. Official Washington view is that production is proving a lesser headache than end use. About 3500 tons of sponge are being used in 1955 and will result in 1800 to 1900 tons of mill products.

Industry and Government sources agree there's an unresolved gap between the metal making and the finished item. Some early estimates of projected use made during the Korean War have had to be revised to fit present-day plans. Growth of metallurgical data on titanium has been less rapid than expected.

In Government circles the belief is that plans for putting the metal to efficient use are properly aimed. Programs to carry out these plans are kept under review, and problems are dealt with as they arise. The Defense Dept. titanium programs are appraised, under contract, by Battelle Memorial Institute.

Another conviction is that spending of more money in utilization research would mean faster advances in metallurgy. Under preparation now for Defense Dept. approval is a list of experimental areas in which additional funds may be spent profitably—a candid effort to buy time with money.

One product of this type of research may be a positive pinpointing of the place of titanium in the aviation field. Heat-resistant qualities make it useful in aircraft and missiles flying at speeds which produce metal-surface temperatures of 400 to 1000 F. Unless much better alloys are made, however, titanium cannot be used at speeds of more than Mach 2.

A swing to greater use of alloys, rather than pure metal, is now in progress. A Government estimate is that titanium is being employed in about 65 per cent alloy form, 35 per cent commercially pure.

A nagging question for U. S. titanium specialists concerns the progress foreign countries may have made with the metal. Russian research is an unknown quantity, though Washington sources say the Reds undoubtedly have some work underway.

More is known about programs in Britain, which is not as far along as is the U. S., and in Japan, a growing producer of a quality product. Japanese titanium is being brought into this country in greater quantity each year, and its sale price is competitive with the domestic product.

(Turn to page 168, please)

## ROTABS Beat Precision Inspection Costs...



This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.



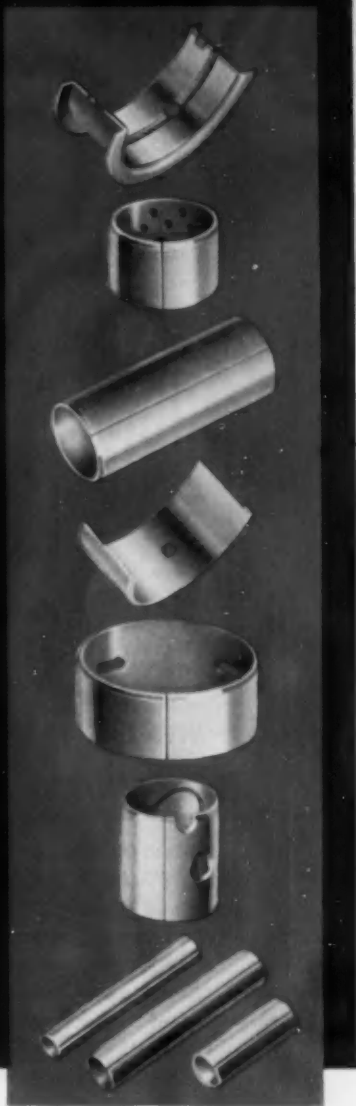
For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:

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# BEARINGS...

## *A Control Factor in Performance!*



RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

Good weather and freedom from mechanical failure used to be the farmer's harvest prayer. Today, weather is his only gamble and even that is reduced by highly dependable, fast-working machines—operating around the clock if need be. An important contribution to this mechanical dependability comes from precision-made sleeve bearings and bushings. They protect the crankshaft, maintain internal lubri-

cation, absorb piston thrust loads, endure extreme heat, dust and long hours of steady work. Quality in their manufacture shows up in dependable field operation. We are specialists in quality bearings and bushings for engine, transmission and chassis applications—and a major supplier to the farm tractor and implement-building industry. Federal-Mogul Corporation, Detroit 13, Michigan.

**SINCE 1899**



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hand tool  
size

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power

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## NEW "L" SERIES

*Reversible and Non-Reversible*  
**SCREWDRIVERS and NUT RUNNERS**

Less than 9 inches long . . . weighing well under 2 pounds . . . requiring only a limited air supply . . . these NEW Buckeye L Series screwdrivers and nutrunners are miniature in every respect—except power.

Into these pocket-size tools is packed all the quiet air power you'll ever need for any fastening job within tool capacity. You can choose adjustable or positive clutch . . . lever, lock button or offset handle . . . in 3,000 or 1,800 RPM speeds.

Designed and built for full-scale production use, Buckeye L Series tools make power tools practical for any fastening operation, even if you use them only intermittently. All the facts will be found in Catalog G-10—Write NOW for your copy.



# Buckeye Tools

CORPORATION

DIVISION 21 • DAYTON 1, OHIO

IN CANADA: Joy Manufacturing Co., Ltd., Galt, Ontario

producers of  
the world's first  
successful  
rotary air tools

(Continued from page 166)

In 1953, the U. S. imported 71,309 lb from Japan. Last year, the import figure rose to 385,045 lb. That quantity has been exceeded in 1955, with four months still to go.



(Continued from page 41)

Firestone Tire & Rubber Co. states that its new one-piece rims and tubeless tires will be standard equipment on many 1956 model trucks.

\* \* \*

R. M. Hollingshead Corp. dedicated its new \$1 million manufacturing and distribution center at Sunnyvale, Calif.

\* \* \*

Reynolds Metal Co. is said to be negotiating for acquisition of a controlling interest in Aluminum Rolling Mills, Ltd., of Quebec, Canada.

\* \* \*

National Vulcanized Fibre Co. has formed an Operating Board responsible for all management policies.

\* \* \*

Solar Aircraft Co. has announced a contract with Bristol Aeroplane Co., Ltd., under which it will lend its jet afterburner knowledge to the British firm . . . North American Aviation, Inc., and Rolls-Royce Ltd., have signed a mutual technical assistance agreement.

\* \* \*

The millionth vehicle to be exported since the end of World War II by British Ford Motor Co. rolled off the assembly line recently at Dagenham, England.

\* \* \*

General Electric Co. has disclosed that more than 15 different foreign concerns have inquired as to whether GE could build atomic reactors for them.

\* \* \*

Rootes Motors, Ltd., has announced a \$40 million expansion program to increase its productive capacity.

(Turn to page 174, please)

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**EVERY TIME!**

Emergency vehicle . . . heavy machinery . . . autos or trucks — the on-the-job performance of Globe batteries is the same: dependable . . . reliable . . . unfailing! That's why Globe batteries are outstanding favorites in the automotive industry!

Every Globe battery is the result of continuous product research and development . . . plus the finest, most modern methods of manufacture. Each battery has the advantage of nearly half a century of battery-engineering experience . . . 33 years of manufacturing batteries for autos, heavy machinery and army tanks.

Users of famous Globe batteries know these batteries can take it, through rugged working conditions and roughest weather. And they know—from experience—that Globe batteries are packed with reserve power to keep engines "spinning" until they start.

Make sure you have the right batteries — Globe batteries—in your automotive equipment from now on. Specify Globe . . . the batteries that are built better to serve better.

## GLOBE-UNION INC.

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FOR FAST SERVICE THERE ARE 16 GLOBE BATTERY PLANTS —  
ATLANTA, GA. • BOSTON, MASS. • CINCINNATI, OHIO •  
DALLAS, TEXAS • EMPORIA, KANSAS • HASTINGS-ON-HUDSON,  
N. Y. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • MEMPHIS,  
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if it's petroleum-powered

there's a **GLOBE-BUILT BATTERY** ...right from the start

## Coated Abrasive Efficiency Maintained by Proper Storage

**T**HE right combination of controlled temperature and humidity keeps coated abrasives at their optimum grinding and finishing efficiency, and assures ease of handling and use, according to a large coated abrasive manufacturer.

Climatic conditions may have an effect on any coated abrasive at some time or other, whether the user is located in what is normally a "dry" climate or one which is generally thought to be "damp."

Continuous studies reported by Min-

nesota Mining and Manufacturing Co., St. Paul, Minn., indicate that ideal storage conditions include a constant storage temperature of between 65 and 75 F and a controlled relative humidity of between 35 and 50 %.

Generally speaking, coated abrasive grinding and finishing efficiency increases as humidity decreases. However, when a coated abrasive product is allowed to dry out too much, brittleness, cupping and difficulties in handling nullify the advantages of increased cut. At between 35 and 50 per cent relative humidity, coated abrasives offer the ideal combination of cutting efficiency and handling ease.

Poor storage conditions may affect coated abrasives in one or more ways. Excessive humidity may cause a softening of the bond, particularly in the case of glue bonds, so that when the mineral grains are presented to the work they tend to push into the backing or lay over on their sides instead of penetrating the work stock.

Excessive dryness, on the other hand, causes brittleness which creates difficulties in handling; possible mineral loss due to the brittleness of the bond, or convex cupping due to shrinkage of the backing as it dries out.

These storage recommendations are offered by the 3M Company: store coated abrasives on pallets, in bins or on shelves, out of direct sunlight; leave the coated abrasive materials in their original packages until ready for use to modify the effects of rapid changes in temperature and humidity; avoid use of storage areas which might be subjected to alternate hot and cold, or wet and dry, cycles; store coated abrasives away from heating equipment or steam lines.

Taking such simple storage precautions will pay off in continued optimum service from coated abrasives. It noted that glue bond papers have been stored for 10 years at approximately 50 per cent relative humidity and 70 F, without noticeable deterioration.

For geographical locations subject to rapid or extreme seasonal changes in climatic conditions, good coated abrasive storage can be provided through the use of cabinets or entire rooms, depending on the volume of coated abrasives consumed. Such storage facilities range from a simple 55-gallon drum or airtight metal cabinet to a walk-in unit.

The smaller type conditioner is made by placing an enameled pan about 9 in. by 18 in. by 2 in. in the bottom of the drum or cabinet. The pan will hold a saturated solution of a humidity control chemical mixed with water. A heavy screen is placed

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"214" DOUBLE  
RIVET SETTER



The "214" automatically feeds, inserts and clinches two rivets at a time...with speed that may mean a big saving in your fastening costs.

14" throat makes large assemblies easy to handle. For up to  $\frac{3}{4}$ " diameter steel tubular rivets—lengths to  $\frac{7}{8}$ ". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility.

Ask us how the "214" can help you cut costs. Send a sample of your problem assembly (or blueprint) for a Free fastening analysis.

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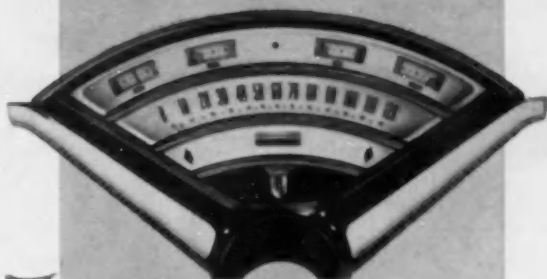
contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

*Chicago Rivet & MACHINE CO.*

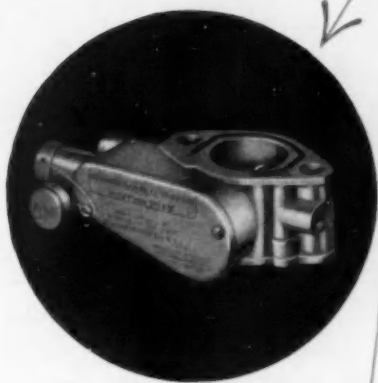
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois

Branch Factory: Tyrone, Pa.

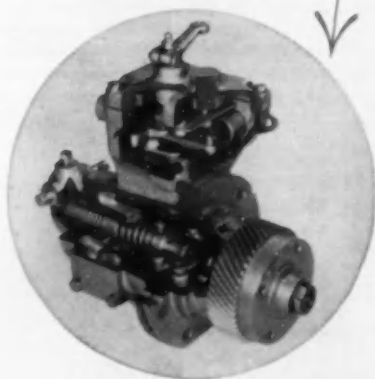
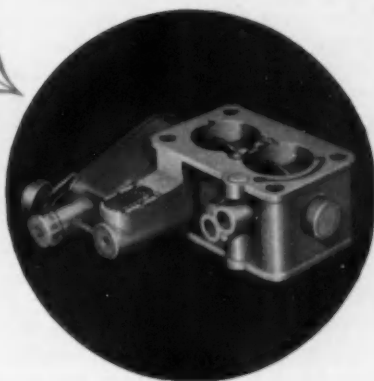
**K-S**  
products are  
**STANDARD**  
in the  
**Automotive**  
**Industry**



**INSTRUMENT  
CLUSTER**



**VARI-SPEED  
GOVERNORS**



**DIESEL GOVERNOR**

King-Seeley automotive dashboard instruments, instrument clusters and governors have been very widely used on passenger cars and trucks for the past 28 years. Among the important reasons are:

- The K-S Research Division works continuously in the development of better designs and more effective processing.
- All K-S products are manufactured under a formal chart system of statistical quality control to assure maximum uniformity and dependability.

When you standardize on these products you provide equipment for your customers consistent in quality with the vehicles you produce.

7173

**KING-SEELEY CORPORATION**  
ANN ARBOR, MICHIGAN





**RAW STAMPING**

**... or anything in-between ...**

**ASSEMBLED  
PRODUCT**



Follansbee's Sheet Metal Specialty Division is now equipped to produce from raw stamping to completely fabricated, finished, assembled and packaged product—even though the stamped metals are only a minor part of the completed job!

No matter what your requirements are or how intricate your specifications, Follansbee engineers will work with you in designing or redesigning your component parts. Complete tool room and die making facilities are available as well as one of the most modern finishing and assembling lines in the industry.

Call Follansbee engineers in early to discuss your stamping problems. A cost analysis on your job will be submitted without obligation.

**SHEET METAL SPECIALTY DIVISION**

**FOLLANSBEE**



**STEEL CORPORATION**

BOX 567 • FOLLANSBEE, WEST VIRGINIA

over the pan to prevent the coated abrasives from touching the solution. Necessary air circulation is provided by installation of a small fan in the side of the drum near the top, with the motor on the outside to eliminate chances of corrosion.

The cover of the container should fit tightly, yet allow easy access. Flat-type stock (such as sheets and disks) are placed on the screen for conditioning; short belts are hung on hooks attached to the inside of the barrel.

It should be noted that it takes a minimum of about three days to condition coated abrasives which have been affected by humidity. Therefore, it is necessary with the smaller type of unit to anticipate future needs for coated abrasives and place them in the conditioner accordingly.

Potassium carbonate has been found to be a highly effective chemical for humidity control since its humidity range centers at about 43 per cent, it is low in cost, and it can be handled easily with normal caution. One tray of potassium carbonate properly maintained in a saturated solution will control between 40 and 50 cu ft of air. A saturated solution is one having an excess of undissolved crystals. "Proper maintenance" includes retaining the saturation in high humidities, and adding water at low humidities.

Other relatively harmless chemicals and the humidities which can be expected from each are calcium chloride, 32 per cent, and sodium dichromate, 52 per cent.

Where coated abrasive consumption is such that a walk-in unit is desirable, it is advisable to call in air conditioning specialists to make recommendations for proper equipment.

For checking humidity readings a direct-reading humidity instrument is acceptable; however, a stationary wet and dry bulb humidity gage is the most effective instrument. Wet and dry bulb readings are simply converted to relative humidity.

In the large room, relative humidity is most accurately measured with a sling psychrometer.

*Readers of  
AUTOMOTIVE  
INDUSTRIES  
are always  
well informed*





# BIG PRESSES FOR DIE TRYOUT- AVAILABLE NOW!

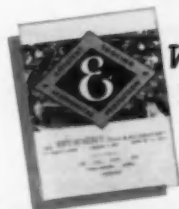
At EFFICIENT every die or tool we build is tested on our own large, modern tryout presses. These presses range up to 1,100 tons capacity (both single and double action presses) with bed dimensions as large as 84" front to back, and 148", right to left, shut height of 84", stroke 34".

After developing and testing of dies, sample parts are produced for your approval. You have no tryout problems because . . .

## EFFICIENT Tooling is "Press-Proved"

The tryout presses illustrated are typical of the equipment housed in EFFICIENT'S modern plants covering 55,000 sq. ft.

EFFICIENT has the machines, the men, the technical know-how and experience to meet your tooling requirements. Large, complex difficult dies are built and "press-proved" in our plant . . . to save production headaches in your plant.



**WRITE OR PHONE**  
For Free Bulletin or  
Tooling Consultation

**THE EFFICIENT TOOL & DIE COMPANY**  
9314 ELIZABETH AVENUE • CLEVELAND 5, OHIO • PHONE Diamond 1-5150



Specify  
**Michigan Tubing**  
for Automobile Parts

A Quality Product

**ROUND**

**SQUARE**  $\frac{1}{4}$ " to 4" O.D. 7 to 22 gauge  
**Gauge** 16 thru 22  
**RECTANGULAR**  $\frac{1}{4}$ " minimum side to 5" maximum side  
11 thru 18  
Carbon 1010 to 1025

### Standard Sizes

| Tube Diameter<br>O.D. Size | Maximum Wall<br>Decimal | BWG<br>Gauge | Minimum Wall<br>Decimal | BWG<br>Gauge |
|----------------------------|-------------------------|--------------|-------------------------|--------------|
| $\frac{1}{8}$              | .065                    | 16           | .022                    | 24           |
| $\frac{1}{4}$              | .083                    | 14           | .022                    | 24           |
| $\frac{3}{8}$              | .095                    | 13           | .022                    | 24           |
| $\frac{1}{2}$              | .095                    | 13           | .022                    | 22           |
| $\frac{5}{8}$              | .095                    | 13           | .028                    | 22           |
| $\frac{3}{4}$              | .095                    | 13           | .028                    | 22           |
| $\frac{7}{8}$              | .095                    | 13           | .028                    | 22           |
| 1                          | .095                    | 13           | .028                    | 20           |
| 1 $\frac{1}{8}$            | .095                    | 13           | .035                    | 20           |
| 1 $\frac{1}{4}$            | .095                    | 13           | .035                    | 20           |
| 1 $\frac{3}{8}$            | .095                    | 11           | .035                    | 20           |
| 1 $\frac{1}{2}$            | .120                    | 11           | .035                    | 20           |
| 1 $\frac{3}{4}$            | .120                    | 11           | .035                    | 20           |
| 2                          | .120                    | 7            | .035                    | 20           |
| 2 $\frac{1}{8}$            | .180                    | 7            | .035                    | 20           |
| 2 $\frac{1}{4}$            | .180                    | 7            | .035                    | 20           |
| 2 $\frac{3}{8}$            | .180                    | 7            | .035                    | 20           |
| 2 $\frac{1}{2}$            | .180                    | 7            | .035                    | 20           |
| 2 $\frac{3}{4}$            | .180                    | 7            | .035                    | 20           |
| 3                          | .180                    | 7            | .035                    | 19           |
| 3 $\frac{1}{8}$            | .180                    | 7            | .042                    | 19           |
| 3 $\frac{1}{4}$            | .180                    | 7            | .042                    | 19           |
| 3 $\frac{3}{8}$            | .180                    | 7            | .042                    | 18           |
| 3 $\frac{1}{2}$            | .180                    | 7            | .049                    | 18           |
| 3 $\frac{3}{4}$            | .180                    | 7            | .049                    | 18           |
| 4                          | .180                    | 7            | .049                    | 18           |

For almost  
**40 years**

Michigan has been manufacturing tubular parts for leading automobile manufacturers. This acceptance of Michigan tubing has been won by meticulous attention to customer requirements and the supplying of the very best in tubing. The following advantages of low cost manufacture and utmost dependability are yours when you specify Michigan for tubular parts in the fabrication of automotive vehicles:

1. It is fabricated in round, square and rectangular shapes, in a wide range of sizes;
2. It is always of uniform strength, weight, ductility and weldability;
3. It can be flanged, expanded, tapered, swaged, beaded, upset, flattened, forged, spun closed, fluted and rolled.
4. It can be formed or machined in your plant or prefabricated at Michigan.



**Michigan**

**STEEL TUBE PRODUCTS CO.**

**Consult Michigan**  
for engineering and technical  
help in the selection of tubing  
best suited to your needs.

Nearly 40 Years in the Business

9450 BUFFALO • DETROIT 12, MICHIGAN  
FACTORIES: Detroit, Michigan • Shelby, Ohio

DISTRIBUTORS: Steel Sales Corp., Chicago, St. Louis, Milwaukee, Indianapolis and  
Minneapolis—Miller Steel Co., Inc., Pittsfield, N. J.—Service Steel Div., Van Pelt Corp.,  
Los Angeles, Calif.—Donald A. Horton, Cleveland, Ohio—Globe Supply Co., Denver, Colo.  
—W. A. McMichael Co., Upper Merion, Pa.—A. J. Fitzgibbon Co., Buffalo, N. Y.

# AI TABLOID AI

(Continued from page 168)

Naval Research Laboratory has announced a new high-temperature, cobalt-base alloy that is said to have indicated uses for jet engine turbine blades and gas turbines. . . . Scientists at the Atomic Power Div. of Westinghouse Electric Corp. have developed a new zirconium alloy.

Micro-Switch Div. of Minneapolis-Honeywell Regulator Co. has purchased a 300,000 sq ft building in Freeport, Ill., from Henney Motor Co.

ElectroData Corp. has moved to new quarters at 460 Sierra Madre Villa, Pasadena, Calif. . . . Pullman Vacuum Cleaner Corp. has moved to a larger plant at 25 Buick St., Boston, Mass.

Acme Aluminum Alloys, Inc., is undertaking a \$500,000 expansion and renovation program.

Aircraft Accessory Turbine Dept. of General Electric Co. has received a contract from Wright Aeronautical Div. of Curtiss-Wright Corp. for a substantial number of self-contained turbo-starters for jet aircraft.

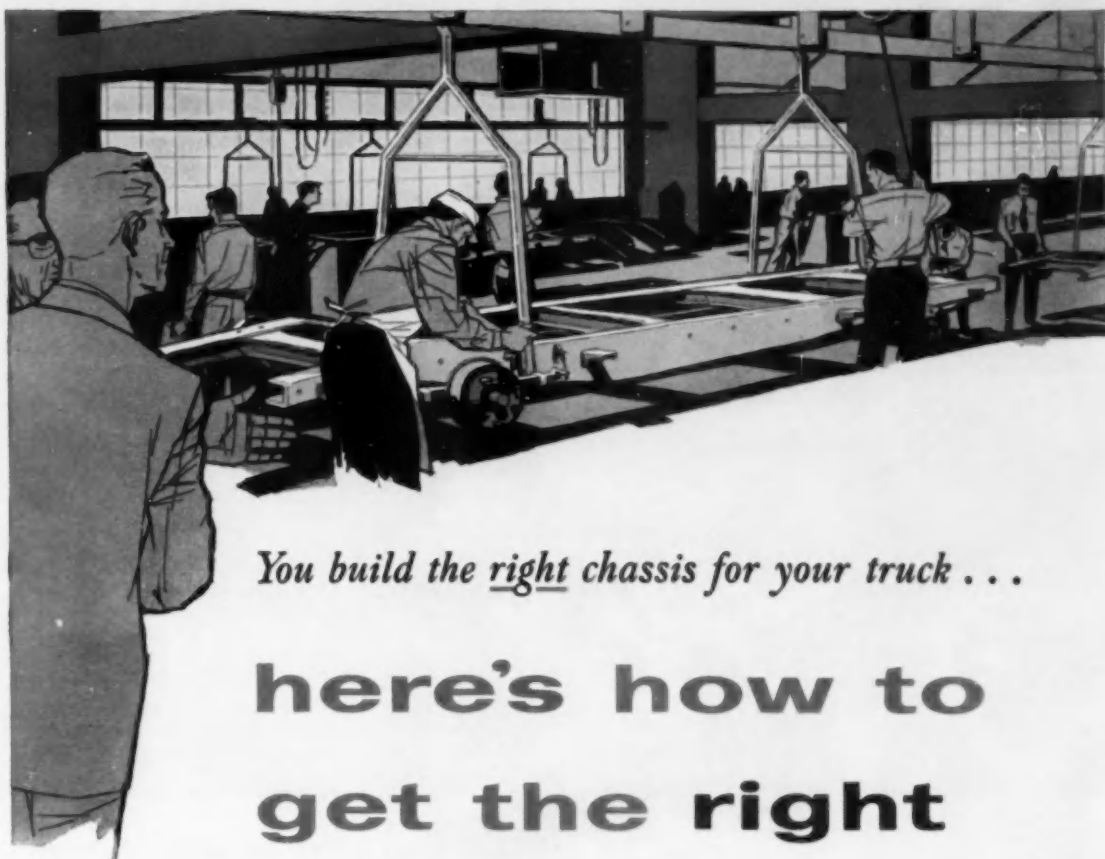
First all-jet vertical take-off aircraft, built by Ryan Aeronautical Co., will begin flight testing soon. The company has also received a \$2.5 million Air Force contract for advanced development of electronic guidance systems for supersonic missiles.

Avco Manufacturing Corp. has acquired an interest in Hycon Manufacturing Co. . . . Holiday Plastics, Inc., has acquired Thermacote Plastic Products Corp.

Baker Brothers, Inc., has opened a new Sales and Engineering Div. at 15414 West Warren, Dearborn, Mich.

Great American Industries, Inc., and Air Associates, Inc., have signed an agreement providing for a merger of the two companies.

(Turn to page 176, please)



*You build the right chassis for your truck . . .*

## here's how to get the right heater, too!

*Call on Evans.* Our engineers will design your truck heater—as you design your truck chassis—to meet the special requirements of the job.

Your Evans heater will be right for your truck in *every* way! It will fit right . . . for quick, easy installation. It will deliver the right BTU output . . . provide maximum safety and comfort for the driver under *any* weather conditions. And it will give many added years of service—thanks to Evans' special, heavy-duty continuous-

service motor, one-piece alloy fan, and sturdy fin and tube type core—all perfectly teamed to give trouble-free, low-cost operation.

For the full story on Evans heating and ventilating systems and what they can do for you, write for a copy of the new Evans Heater Catalog . . . or better still, phone or write to have an Evans engineering consultant call on you, at no charge. Evans Products Company, Department P-9, Plymouth, Michigan.

REGIONAL REPRESENTATIVES: Cleveland, Frank A. Chase • Chicago, R. A. Lennex Co., Inc.  
Detroit, Chas. F. Murray Sales Co. • Allentown, Pa., P. R. Weidner



. . . Complete truck and bus systems . . . built right for the job



# AI TABLOID AI

(Continued from page 174)

Westinghouse Electric Corp. has formed an Industrial Heating Div. It will be headquartered at Meadville, Pa.

Solar Aircraft Co. has received a Navy contract to develop a 300-kw, 60-cycle generating set. It will use the constant speed version of Solar's 500-hp Jupiter gas turbine engine as a prime mover.

Celanese Corp. of America will start construction soon of a new plant for plasticizers and hydraulic fluids and compounds at Gallipolis Ferry, W. Va. . . . Thompson Chemical Co. will build a plant for the manufacture of polyvinyl chloride at North Dighton, Mass.

The Motor Truck Div. of International Harvester Co. has introduced three new cab-over-engine models—the CO-180 series—with GVW ratings of 17,000 to 21,000 lb.

Raybestos-Manhattan, Inc., has moved the sales headquarters of its Packing Div. from Manheim, Pa., to Passaic, N. J. . . . Synthane Corp. has moved its sales office in the area to 137 W. Commercial St., East Rochester, N. Y.

Johns-Manville Corp. has formed a new service group, headquartered in Detroit's Fisher Bldg., to increase its specialized assistance to the automotive industries. . . . Vibro-Ceramics Corp. has inaugurated a consulting service in all phases of ultrasonics for industrial and scientific programs.

Polycast Corp. is name of new company recently formed in Stamford, Conn., to provide a manufacturing source of supply for cast plastic sheets, rods, and tubes.

Consolidated Engineering Corp. has set up the framework of a worldwide sales organization with the recent appointment of export representatives in 19 countries.

National Airlines, Inc., has announced a \$95 million expansion program which includes the acquisition of both jet and turbojet aircraft.

Fiber Glass Div. of Ferro Corp. is doubling its facilities at Nashville, Tenn., and a new fiber glass mat production unit is being built in California.

Plans were laid in New Delhi recently for a federation of the automobile associations of India.

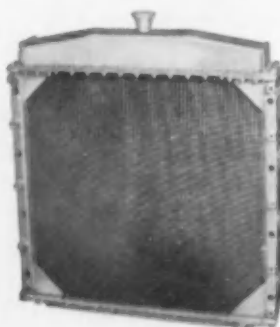
Matthews Conveyor Co. is combining the celebration of its 50th anniversary with completion of a broad expansion program.

Continental Aviation & Engineering Corp. has obtained sizable additional contracts from the Air Material Command for J-69 jet engines. . . . McDonnell Aircraft Corp. has placed a \$57 million order with Glenn L. Martin Co. for F-101 Voodoo fighter plane wings.

Northrop Aircraft, Inc., and its subsidiary, Radiophone Co., plan a plant in El Paso, Tex.



... built rugged for rough going ...



Where the going is rough and the job is tough, that's where you will find a quality, YA Radiator on the job meeting the demands for efficient cooling. YA Radiators can take it. Illustrated is a crawler tractor feeding sand to a dragline from a river sand pit. The tractor is equipped with a YA Radiator that will stand up under the vibrations and stress of crawler tractor operation where load factor is very high. YA Radiators are used on this type of construction machinery the world over. Perhaps the equipment you manufacture calls for this type of radiator equipment. . . . a letter from you will bring complete information on YA radiators.

Write Yates-American, Beloit, Wis., U.S.A.

California Representative: E. E. Richter & Son, Emeryville, California





*Send For Free Print—1913 Simplex*

This "streamlined" 1913 Simplex was almost totally hand-made, with all vital parts of imported chrome-nickel steel. It had a water-cooled, four-cylinder engine rated at 50 h.p., a 126½-inch wheel base, and a double-side chain drive.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy of this print, suitable for framing. Morse Chain Company, Ithaca, New York.

## **Over 60,000,000 Morse Timing Chains insure long service life of cars, trucks, and busses**

**Manufacturers of thirteen** of the seventeen cars which now use timing chain drives specify *Morse Timing Chain Drives* as original equipment. Over the years, more than 60,000,000 of these drives have been supplied by Morse to the auto industry!

Precision-built Morse drives give car, bus, and truck owners long service life—plus freedom from maintenance worries.

**If you have problems** involving timing chain in design, development or

application, check first with Morse. We have expert engineering service available to help you solve them quickly, profitably.

For further information, call, wire, or write: **MORSE CHAIN COMPANY**, Ithaca, New York.

# **MORSE**



**CHAINS, CLUTCHES,  
AND COUPLINGS**



# SERV-RITE

## Insulated Thermocouple Wire Extension Lead Wire

FOR

PLATINUM COUPLES  
CHROMEL ALUMEL  
IRON CONSTANTAN  
COPPER CONSTANTAN  
IRON CUPRONEL

No matter what your wire or insulation requirements may be, you can depend on Gordon "Serv-Rite" insulated wire for pyrometers—recognized as a standard of highest quality for nearly half a century. All "Serv-Rite" wire is now manufactured in the new, completely modern Gordon plant, employing up-to-date equipment and machinery, supervised and operated by skilled technicians—your guarantee of continued precision quality. In addition to maintaining large stocks of all common types of wire, Gordon will manufacture special insulation, in long or short runs, to suit your individual needs and meet your most rigid specifications.

### All Types of Insulation

Felted Asbestos  
Asbestos Braid  
Weatherproof Braid  
Glass Braid  
Polyvinyl Plastic  
Nylon Braid  
Stainless Steel Armored Braid  
Silicone Treated  
Cotton Braid  
Lead Jacket

Ask for Bulletin No. 1200 for Application Data and Complete Specifications on Thermocouple and Extension Wire

**GORDON  
SERVICE**

**CLAUD S. GORDON CO.**

Manufacturers & Distributors

Thermocouple Supplies • Industrial Furnaces & Ovens  
Pyrometers & Controls • Metallurgical Testing Machines  
601 West 30th Street, Chicago 16, Illinois  
2037 Hamilton Avenue, Cleveland 14, Ohio

## MEN in the NEWS

(Continued from page 45)

General Electric Co.—Thomas H. Reilly has been made manager of advertising and sales promotion for the Silicone Products Dept.

Aluminum Co. of America—Lewis P. Favorite has been named manager of products sales; Frederick J. Close, manager of market development; and W. S. McChesney, manager of industry sales.

Ford Motor Co., Tractor & Implement Div.—Walter T. Murphy has been promoted to assistant general sales manager of advertising, sales promotion, and training.

Westinghouse Electric Corp., Aviation Gas Turbine Div.—D. W. Berry has been appointed assistant chief engineer.

Link Aviation, Inc.—Eric L. Sokol was named manager of quality control.

## The Business Pulse

(Continued from page 100)

operations. At present a restrictive policy in this area would unquestionably be effective in controlling the volume of credit available to businessmen and consumers, since commercial banks, as a group, do not have any appreciable volume of excess reserves. Also, while the Federal Reserve has no direct power to regulate consumer credit, the Board has nevertheless met recently with representatives of banks and officials of the principal finance companies with the apparent intention of instilling a more cautious lending attitude among this group. In other words, the Federal Reserve Board has been stepping up its endeavors at "moral suasion." The Government also has taken action aimed at moderating the rapid expansion of credit. Most recently, the Federal Housing Administration and the Veterans Administration have increased the down payments required for the purchase of homes involving Government-backed mortgages and also reduced the maximum mortgage period from 30 to 25 years.

The cause of the higher interest rates and of the Federal Reserve Board's and Government's restrictive actions is not difficult to pinpoint. All one needs to do is to examine the growth of debt which has taken place this year. Whereas the business loans



*An oil seal for every purpose!*

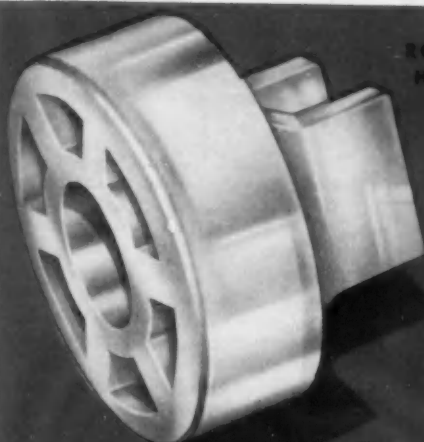
Universal Oil-Seals are assembled units ready for installation of vital friction points. They are available in special designs up to 48" diameter shafts with optional leathers, synthetic rubber or composition packings.

STANDARD SEALS CARRIED IN STOCK. WRITE FOR COMPLETE CATALOG.

— UNIVERSAL OIL SEAL CO. —  
PONTIAC 12, MICHIGAN

How many ways can **you** use

# DOT PLASTIC *snap in* NUTS?



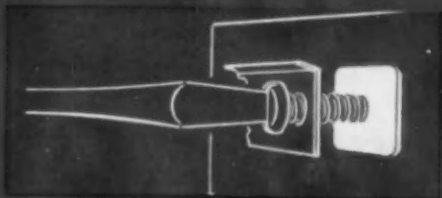
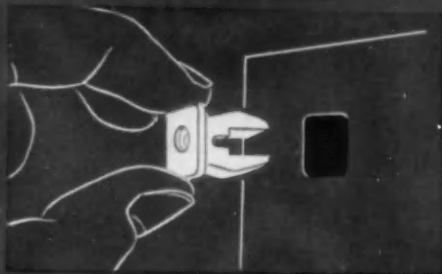
ROUND  
HEAD



SQUARE  
HEAD

## QUICK, EASY ASSEMBLY

Nut is pushed into square hole punched in sheet metal.



Ordinary sheet metal screws cut its own threads as it is driven into the nut, expands fingers, locks nut and screw securely.

United-Carr's new self-locking, plastic nut is designed for blind application and can be used with all types of metal finishes without scratching or chipping the surface. Its plastic fingers provide rigid anchorage yet will not mar paint, polished metals or even porcelain.

Inexpensive sheet metal screws cut their own threads and expand the nut's fingers as they are driven, locking both nut and screw tightly in

place. Screws can be removed and replaced several times without damage to the nut.

DOT plastic snap-in nuts are electrically non-conductive and provide a high degree of insulation against heat transfer. For all practical purposes, they also provide an effective vapor seal.

Available in several styles and sizes. Write for full information and samples or contact your nearest United-Carr representative

## UNITED-CARR FASTENER CORP.

CAMBRIDGE 42, MASSACHUSETTS

MAKERS OF

**DOT**

FASTENERS

# THERE'S NO SUBSTITUTE FOR LUBER-FINER'S ENGINEERED PROTECTION!



USE ONLY GENUINE

*Luber-finer*

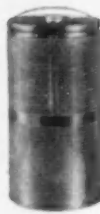
**DIESELPACKS**

**YES! IT'S WHAT'S  
INSIDE THAT COUNTS!**

The Efficiency of Luber-finer's  
Exclusive Patented Process  
**HAS NEVER BEEN EQUALLED!**



Only a Luber-finer Unit Plus a  
Genuine Luber-finer Pack can  
give the Exclusive Patented  
Filtering Process that has made  
Luber-finer The Standard Of The  
Industry Since 1936!!



**THERE'S A LUBER-FINER MODEL FOR EVERY TYPE  
OF ENGINE...EVERY TYPE OF OIL!!**

## LUBER-FINER PACKS AVAILABLE

**1. REFINING PACK**—Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

**2. DIESELPACK**—First made available in 1941, the DIESELPACK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

### DON'T BE MISLED BY PRICE ALONE!

There is NO substitute for DIESELPACK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!

The DIESELPACK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

**IT PAYS TO GET THE BEST!**

### STANDARD OF THE INDUSTRY SINCE 1936

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines

WRITE FOR COMPLETE INFORMATION TO DEPT. 4

**LUBER-FINER, INC., 2514 S. Grand Ave., Los Angeles 7**

of commercial banks, for example, usually decline seasonally during the first six months of the year, such loans (in the banks that report weekly to the Federal Reserve System) rose by more than a billion dollars in the first half of 1955. In recent weeks they have continued to expand rapidly. Mortgage debt and consumer credit have also been surging ahead at an exceptionally brisk pace this year.

### Advancing Prices

The combination of enlarged credit and expanded business volume has begun to have an impact on the price structure which undoubtedly caused uneasiness in official circles. Over-all price indices have not moved in any appreciable measure as yet, but substantial increases have occurred in a number of very important individual commodities. Advances have been registered of late, for instance, in steel, copper, nickel, coal, rubber, tires, and various types of scrap. Such increases represent a potential threat to the stability of the dollar.

But while the cause of the higher interest rates and of the emergence of restrictive attitudes is obvious, the probable effects are not so readily discernible. For one thing, there is no general agreement among economists or monetary experts as to the degree to which the demand for capital is affected by changes in interest rates. From a logical standpoint an increase in the cost of capital should diminish the demand for it, other things being equal. The catch is that other things are seldom equal. Specifically, when profit expectations are changing—and there is some evidence that optimism on this score is presently rising—then a rise in interest rates is very likely to be overshadowed as the determining factor in a decision to borrow. Restriction of the availability of credit seems at first consideration a little more amenable to analysis, since banks at present are pretty well loaned up. But there are complicating factors here too. Most important, perhaps, is that the Government will be a heavy borrower of new money in the latter part of this year. Because of this, the Federal Reserve may find it necessary to extend a considerable amount of credit to the banking system through open-market operations in order to assure orderly conditions in the Government securities market. In brief, there are a multitude of intangibles which make it extremely difficult to judge the probable consequences of the recent trend of events in the capital and money markets.



## Standard symbols for **PRECISION**

A "mike" and an Allen Key keep steady company wherever precision measurements and precision adjustments go hand in hand . . . and where positive locking and vibration-free performance are important to maintaining precision.

Look for the First Name in precision screws at the Industrial Distributor who stands first in *his* field in your locality. He has the stock, the experience, and a wealth of specific information on applications for precision fastenings that you will find invaluable.



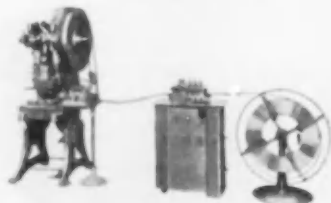
# FLEXIBILITY in Stock Straightening



## WITTEK

### STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

**WITTEK Manufacturing Co.**



4319 W. 24th Place • Chicago 23, Illinois

# What's Coming in 1956 Chrysler Corp. Cars

(Continued from page 69)

Chrysler will offer a single rocker arm V-8 and a larger displacement double rocker arm V-8. The Imperial line will have a double rocker arm V-8.

### Other New Features

The complete Chrysler family line will include 60 body styles. Plymouth will have 15; Dodge, 16; De Soto, 11; Chrysler, 13; and Imperial, five.

Of particular interest is the rear-window arrangement in the four-door hardtops which will be offered by all divisions. Interior dimensions are identical with the regular four-door sedan, including a full-sized rear window.

A unique development is the divided rear side window, in which the small rear section folds forward and down along side of and inside the main section of the rear window, which has normal up-and-down travel. One regulator operates both sections simultaneously. This arrangement permits use of the full-sized window which can be rolled completely into the door.

Also interesting is the push-button automatic transmission control, which is standard on all lines. The control provides positive mechanical range selection and consists of a single cable which works off a rocker arm actuated by push buttons. The cable connects to valving at the transmission which controls the various gear positions corresponding to the push-button settings.

An additional feature is an automatic cut off which prevents putting the car into reverse at speeds above 10 mph. The push-button control is located on the instrument panel to the left of the driver. The buttons operate at from three to five lb pressure.

Available on all lines will be a new power brake unit on automatic transmission-equipped models. The current power brake unit will be retained on

models using the standard transmission.

Principal feature of the new power brake is a direct mechanical linkage from the power source to the braking system. Basically, it consists of a bellows filled with air at atmospheric pressure and connected through mechanical linkage to the brake pedal. When brakes are applied, the linkage opens a valve in the interior of the bellows to a vacuum source.

Contraction of the bellows actuates a lever which applies braking force through direct mechanical linkage to the master cylinder. The vacuum source includes a reserve ample to provide several stops when the engine is not running.

In the event of a sudden loss of power, the unit automatically is divorced from the linkage. The necessity of compressing the spring-loaded bellows before pressure can be applied to the brakes is thus eliminated.

A new type braking system will be standard on De Soto and Chrysler lines in 1956. Named Center-Plane Brakes, the system uses floating shoes mounted between two plates located on the center plane of the linings.

Since wheel cylinders are mounted in the same plane, braking forces are transmitted across the full width of the lining and give uniform pressure at all times. The lining width has been increased to 2½ in. from two in.

Due to the floating shoe principle, compensation for brake wear is simpler and consists of one cam adjustment. Alignment of shoes or heel-and-toe adjustments no longer are required.

Principal advantages cited by Chrysler for the new brake are greatly increased lining wear, lowered pedal effort, and high anti-fade characteristics. Chrysler says that up to six consecutive very high-speed stops can be made successfully, compared with one or two with conventional brake systems.

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Bonds**

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PRECISION  
LINE

**Fellows**

Gear Production Equipment

The Fellows Gear Shaper Company, Springfield, Vermont, U.S.A.



# "Saves thousands of dollars and tons of weight"

Professional problem for Budd Company engineers designing the Budd RDC rail car was getting smooth, shock-free power transmission in a Diesel-driven unit that would increase railroad passenger traffic and revenue.

Low-cost solution was lightweight Allison TORQMATIC DRIVES.

The Budd Company reports, "That engineering decision saved us several thousands of dollars and 7,000 pounds per rail car." The TORQMATIC Converter-Transmission teams have proved their reliability in millions of miles of service.

The Boston and Maine Railroad — who will soon have 64 RDC's in its fleet — expects from experience to save \$1,700,000 per year with the new units.

Passengers flocking to ride Budd RDC rail cars on 21 different railroads are pleasantly conscious of the infinitely smooth starts, silken acceleration, and up to 90 m.p.h. top speeds that give them faster, more comfortable commuting.

While railroad executives beam when they see their savings—two roads report Budd RDC's cut their out-of-pocket operating costs in half compared to the equipment the rail cars replaced.

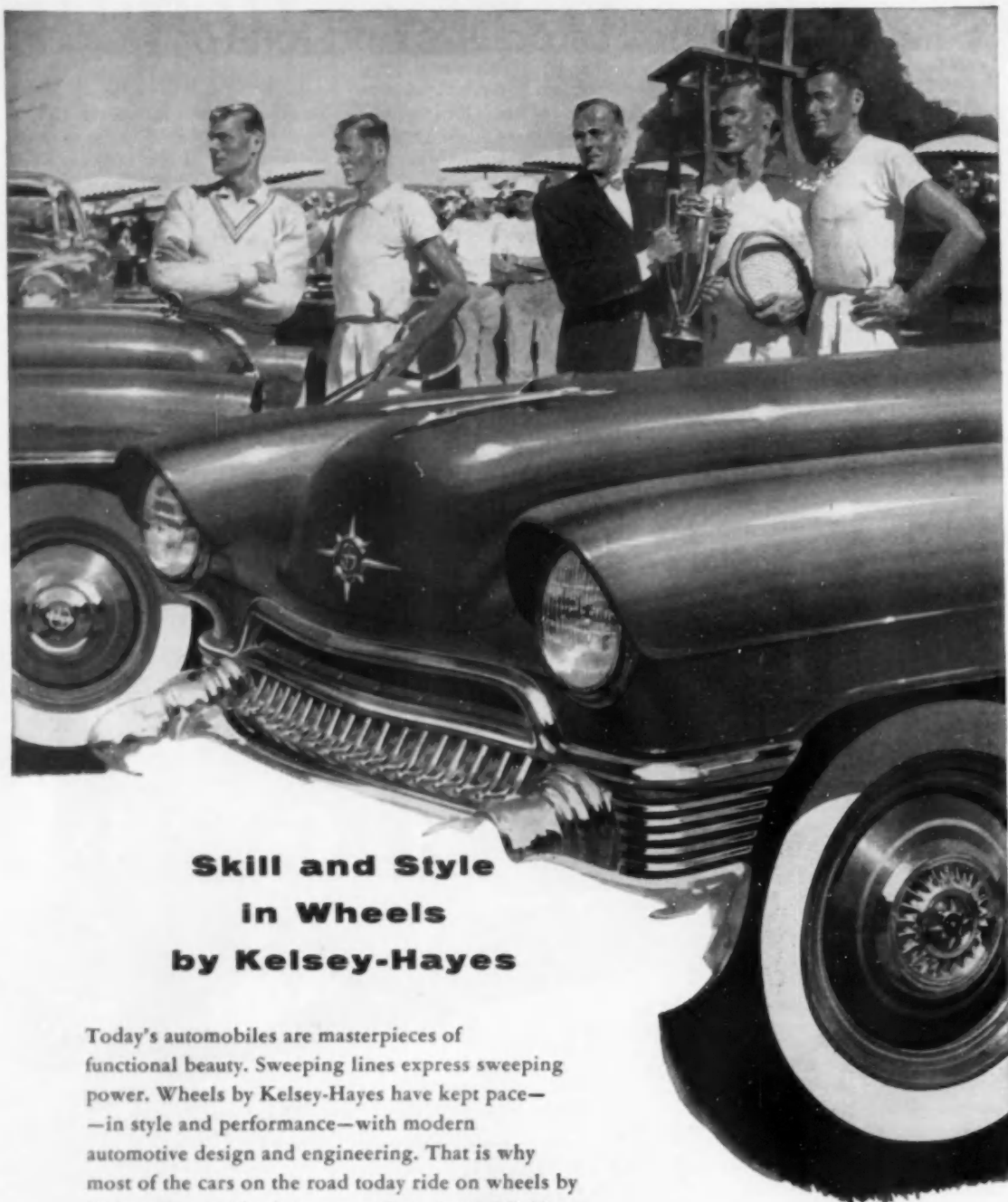
If you'd build or buy better equipment, investigate Allison TORQMATIC DRIVES. You'll cut costs all along the drive line—get smooth shock-free power transmission in compact units proved on thousands of tough jobs.

You can get Allison TORQMATIC Converters for gasoline or Diesel engines from 40 to 400 horsepower—TORQMATIC Transmissions to handle up to 300 h.p. Ask your equipment dealer or manufacturer about Allison TORQMATIC DRIVES next time you buy or write direct for more information.

Allison Division of General Motors,  
Box 894A, Indianapolis 6, Indiana



*Allison*  
**TORQMATIC DRIVES**



**Skill and Style  
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by Kelsey-Hayes**

Today's automobiles are masterpieces of functional beauty. Sweeping lines express sweeping power. Wheels by Kelsey-Hayes have kept pace—in style and performance—with modern automotive design and engineering. That is why most of the cars on the road today ride on wheels by Kelsey-Hayes Wheel Company, Detroit 32, Michigan.

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9 Plants — Detroit and Jackson, Mich. ...



- greater production
- lower costs
- smaller investment

## PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

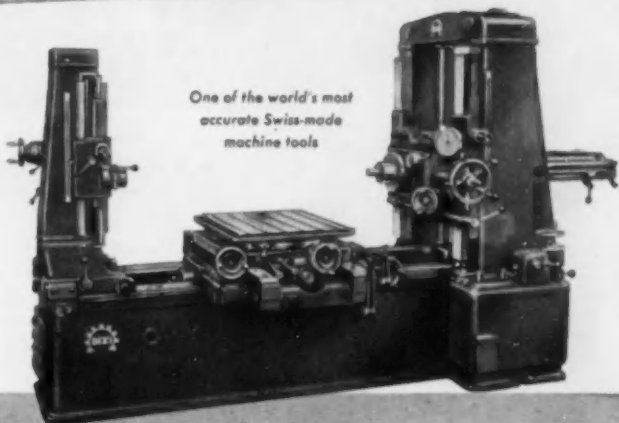
### Dixi 60

#### Horizontal Jig Borer

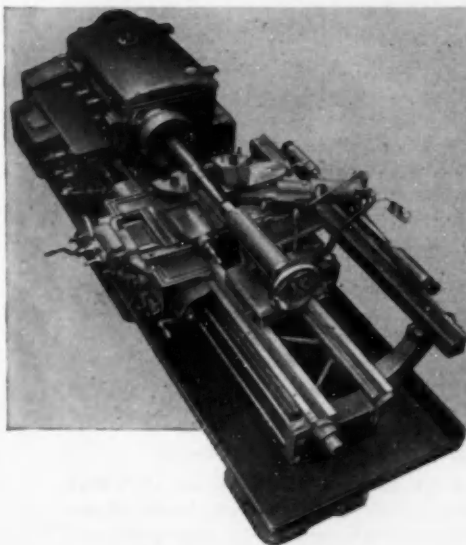
##### With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28 1/4" x 32 1/4" max. distance spindle to table 19 1/4". Table travel 23 1/4". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



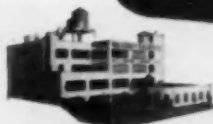
#### Heavy Duty Lathe High Precision, Reliability, Top Performance Schaefer Model UN-450

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17 1/4" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

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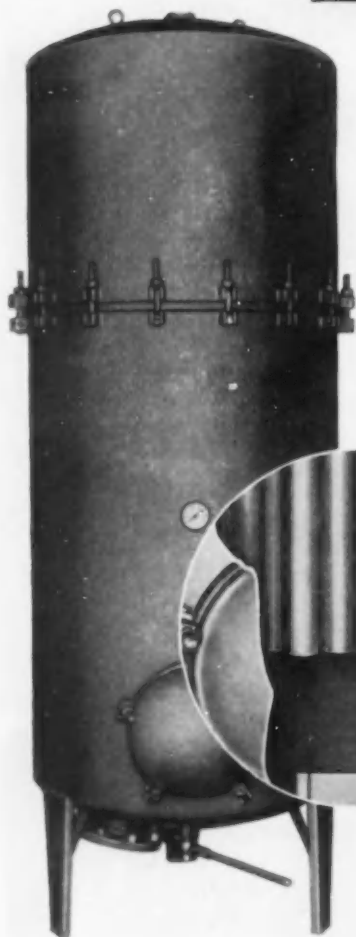
for water based and mineral oil coolants  
used in central systems

**new!**

## Houdaille Pre-Coat Filter

—the only filter of its kind that's

**COMPLETELY  
SELF-CLEANING**



● An exclusive backwashing feature built into the new Houdaille Pre-Coat Filter eliminates manual cleaning entirely! It works by gravity . . . no costly, complicated valves, piping or scrapers required. During the filtering period, constant pressure forces clean coolant upward into a specially designed dome. By simply stopping pump, this flow is reversed, sending clean coolant from dome down through tubular screens. Contamination collected on screen surfaces is washed away in seconds. Full-flushing action completely unclogs screen openings, assuring longer filtration cycles.

### Designed for High Flow, High Efficiency in Precision Metal-Working Operations

In large scale production of precision metal parts, such operations as grinding, honing and lapping call for large volumes of coolant completely free of sludge, chips and other abrasive particles. The

Houdaille Pre-Coat Filter provides the fast, thorough micron filtration necessary to meet both production and quality control demands. One or more filters are mounted on a central system tank to handle any volume of coolant.

### Features 199 Tubular Filter Screens

Tubular screens (see inset) are suspended beneath dome on a circular steel plate. Made of fine mesh Monel metal, space-saving tubes provide filtering surface equal to that of flat screens while reducing tank diameter 30%.

### Takes Contamination Out, Leaves Additives In

Screens are coated with diatomaceous earth filter aid powder before filtration cycle begins. Diatomaceous earth removes the most minute solid particles without removing additives. In normal operation, only one pre-coat is needed daily.

Equipment Bulletin 701 gives complete operating data on the Houdaille Pre-Coat Filter. Write for your copy today



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**HOUDAILLE-HERSHEY OF INDIANA, INC.**

FILTRATION DIVISION



## Here's Where Steel Goes Soft

This is a view in the annealing department in the bar mills at our Lackawanna, N. Y., plant, where big, modern coil-annealing furnaces give steel the precise touch of softness required for such applications as cold-heading.

Much of the output of these furnaces, year in and year out, goes to the country's automotive producers. For example, after they have been annealed the coils shown here will be converted by cold-heading and threading into the engine and chassis bolts for many a family sedan.

Bethlehem carbon-steel bar products, hot-rolled at our Lackawanna and Johnstown, Pa., plants, include standard sections, special sections and bar-size shapes. Also semi-finished products: blooms, billets and slabs. Would you like to have further information? We suggest that you phone or write the Bethlehem sales office nearest you.

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

# BETHLEHEM STEEL







Faxfilm, 23X, shows characteristic phosphate coating obtained on steel by using conventional alkali cleaner followed by phosphating material without ICRA. Note size of crystals.



Faxfilm, 23X, shows characteristic phosphate coating obtained on steel by using same alkali cleaner and Bonderite with ICRA. Note extremely fine crystals.

## New Bonderite 800 series contains I C R A

(INTERNAL CRYSTAL REFINING AGENT)

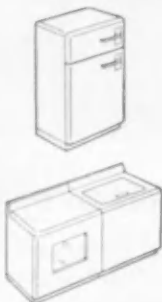
### Built-in improved performance!

In the new Bonderite 800 Series, Parker presents a great new development in zinc phosphate coating. ICRA—Internal Crystal Refining Agent—produces a denser coating with finer crystalline structure. Use it on steel surfaces, and on zinc surfaces such as galvaneal, zinc base die castings, and electrogalvanized in mixed production with steel.

The very smooth, continuous phosphate surface produced by 800 Series Bonderites makes for exceptional evenness of paint penetration, with greater uniformity of paint luster. Metal coated with 800 Series Bonderites may be rubbed, bent or flexed without loss of coating bond. This means better adhesion of paint, also.

Many types of Bonderite with ICRA are available in the 800 Series. You can choose the one best suited to your needs as to method of application, processing time and temperature, and coating weight.

Get full information on Bonderite 800 Series with ICRA. Call or write today.



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**TROPICAL**  
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On the assembly line of a leading automotive manufacturer, workers are installing Johnson bearings in a popular six-cylinder engine.

## Leading Automotive Manufacturer Depends On Johnson As A Supplier Of Bearings

**Here's Why:** First, Johnson engineers, metallurgists, and production men devote all the time necessary to help solve problems in the design and production of engine bearings to meet demands for higher speeds and longer service.

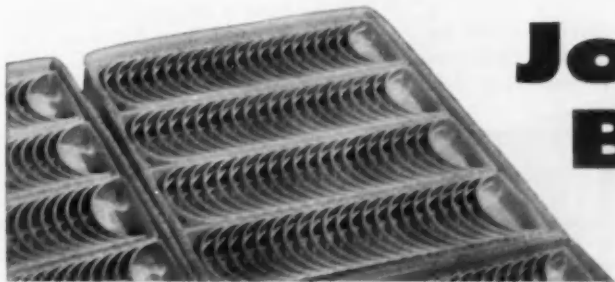
Second, Johnson, as a leading supplier of original equipment bearings to automotive manufacturers, can be depended upon to meet exacting specifications bearing after bearing, order after order when it comes to tolerances, smooth, mirror-like finish, and chemical analysis of the

various metals specified.

Third, Johnson has built a reputation for getting bearings delivered when and where they are wanted and in the type of packages ordered.

Fourth, Johnson's prices are competitive with other leading bearing manufacturers.

If you have a problem in the design of engine bearings, a Johnson man might have your answer. It won't cost anything to talk it over. Write, wire, or phone the Johnson Bronze Co., 625 S. Mill St., New Castle, Pa.



# Johnson Bearings



**“WOW! what happened  
to our labor cost  
on this run?”**

How many times—and how recently—have you asked this question? It's a good one, with a lot of possible answers. The important thing is, can these skyrocketing costs happen again, or have the causes been corrected? Often the answer is very simple—and easily remedied.

**Could this  
be your  
answer?**

A batch of castings or forgings with cracks that nobody found until costly hours had been wasted machining and finishing them . . . a heat treat that went sour . . . improper grinding, handling, cleaning, all are possibilities, and all can vary from run to run.

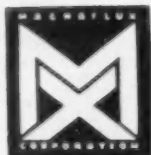
Cracks, whatever the cause, run up your labor costs if you don't find them *early* enough. Early enough to find

and correct the cause before parts are run and finished in quantity, only to be scrapped.

Inspection is low cost with Magnaflux' Methods and it finds all cracks...helps you find the cure. It can save you many times its trifling cost.

Ask to have a Magnaflux engineer give you facts and figures—or write for new booklet on **LOWER MANUFACTURING COST.**

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✱ By varying the number of springs in multiples of three, *Lipe* can adapt the five sizes of its new Direct Pressure Clutch to all engines developing from 300 to 1300 ft-lb of torque. For example: depending on its service, a 15" DP can be furnished with its full complement of 27 springs . . . or only 24, 21, 18, or 15.

The advantages of this unique *Lipe* feature are obvious. Manufacturers will find it may be possible to standardize on a single clutch size to meet *all* torque requirements. Fleet Owners will notice the significant reductions in maintenance since clutches won't be under- or over-loaded.

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Manufacturers of Automotive Clutches & Machine Tools



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# FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



## Technical-ities

By John S. Davey

### The Proper Loading of Bolts

The pre-load, or residual tension, in a tightened bolt means more to assembly strength than the actual strength of the bolt itself.

In a joint, a bolt torqued to its proper load level resists a maximum amount of external load without loosening. Designers can take advantage of this fact and assure better results, and at the same time, cut costs.

**For example:** One designer calculated that truck frames needed high strength bolts at least  $\frac{1}{2}$ " in diameter. So he used  $\frac{1}{2}$ ". But on the assembly line, these were being torqued to 100 ft.-lbs. whereas they needed at least 200 ft.-lbs. for proper residual tension. The  $\frac{1}{2}$ " bolt at 100 ft.-lbs. would actually have given the stronger assembly and at less cost.

In another case, the bucket on earth moving equipment was always coming loose. The design engineer kept increasing the size of the bolt up to  $1\frac{1}{4}$ ", but to no avail. The impact wrench used was supplying far too little torque for this size. We suggested a return to the original  $\frac{3}{4}$ " bolt used, set up to 350 ft.-lbs. torque. It solved the problem.

In short, the more you stress a bolt within its elastic limit, the greater its ability to stay tight and make a strong assembly.

## Symmetrical flow lines assure strong bolt heads

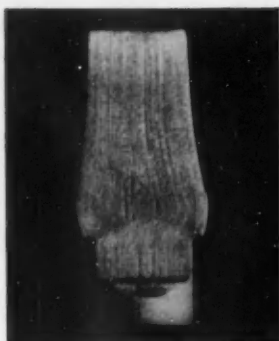


Photo of perfect cold worked blank after first upset.



Effect of improper forming is a poor head like this.

IN THE manufacture of bolts and cap screws, the first upset of metal is a vital one. It determines the flow lines in the bulb which will form the head. A symmetrical flow assures no laps and, therefore, no weak spots or cracks in the final upset of the head.

### MACHINE OPERATOR'S SKILL VITAL

The upper photo shows a longitudinal section of a blank after the first upset and on its way to becoming an RB&W standard bolt. Note the even distribution of flow lines. This bulb will become a perfect head.

The lower photo shows what can happen with poor tools, inexperienced operators or without precision setup of the cold headers. Note how pronounced is the unbalanced flow pattern which resulted from a bulb with just a minute defect.

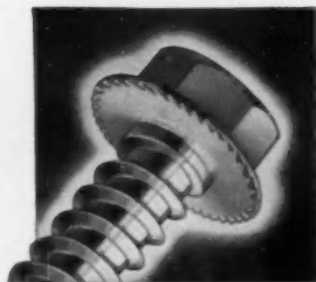
### DEPENDABLE FASTENERS

Cap screws and bolts also get a bright smooth finish from the right kind of cold forming. But above all, they offer the designer low cost fasteners with sound internal structure. Standard RB&W fasteners can be loaded to their proper level—become a strong point in any assembly.

For help on your fastener problem, contact Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

## The Only Screw That Stays Tight

The continual heating and cooling caused loosening of handle screws on the flat irons of one manufacturer. Every type tried failed to stay tight until RB&W's unique Spin-Lock tapping screws were used. This solved the problem. Their hardened teeth lock into the surface, require more torque to loosen than to tighten. One piece fasteners, they speed assembly time.



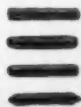


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NEEDLE CARTRIDGES  
AND  
NEEDLE BEARINGS  
WITH NEEDLE RETAINERS

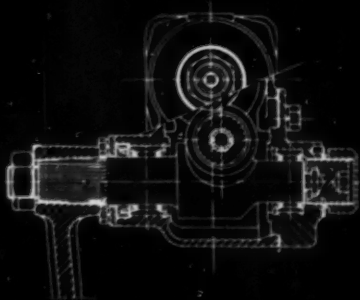
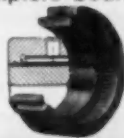
loose needles



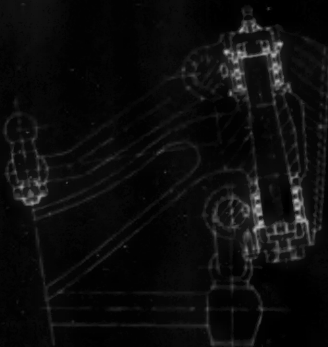
needle cartridges



complete bearings



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200,000 miles of service without  
any major compressor  
maintenance cost."\***



\* Says: **WALTER SAYLES**, Superintendent of Maintenance  
**MORRISON MOTOR FREIGHT, Inc.**, Akron, Ohio

It's a matter of record, from hundreds of case histories, that **WAGNER AIR BRAKES** render the reliable safety-proven performance fleet operators demand. This dependability is the result of more than thirty years' experience in manufacturing brakes and complete brake systems. The advantages of **WAGNER AIR BRAKES** gained by Walter Sayles of Morrison Motor Freight, Inc., are indicative of this outstanding record.

**WAGNER AIR BRAKE SYSTEMS** are available either as "straight air" or "air-over-hydraulic," and all feature the **WAGNER ROTARY AIR COMPRESSOR**. Learn for yourself why more and more safety-minded, cost-conscious fleet operators are specifying **WAGNER AIR**.

Because of the ever-increasing demand for greater road and cargo safety and maintenance economy, it will pay you to include Wagner Air Brakes as standard equipment on the vehicles you manufacture.

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About 90% of our tractors have Wagner Air Brakes and it has been my experience, as Superintendent of Maintenance, that your Rotary Air Compressors have done an excellent job for us in the past 3 years. Wagner Air Brakes have averaged 200,000 miles of service without any major compressor maintenance cost. We also appreciate the quiet operation of the compressors.

Sincerely,

*Walter Sayles*

Walter Sayles  
Superintendent of Maintenance



**WAGNER AIR BRAKE USERS  
ARE OUR BIGGEST BOOSTERS**

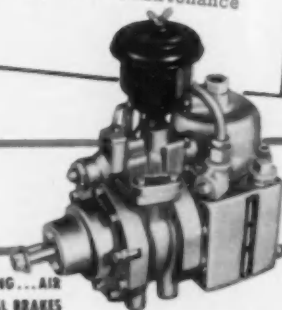


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KSS-2A

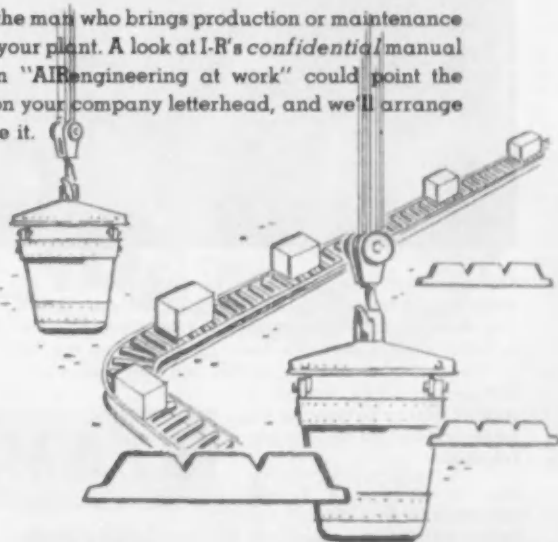
# *Air Motor* *Takes "Backache" Out of Molding Job...* *SAVES \$3.10 a day..*

A large producer of aluminum parts had a number of strenuous jobs. One involved manually moving a four foot rack and pinion handle through a 200° arc to raise and lower a collapsible core in a book mold.

AIRengineering was put to work. An Ingersoll-Rand Size 55SO Air Motor was installed to operate the pinion. Production jumped from 180 to 220 pieces per day . . . workers no longer complained . . . and savings amounted to \$3.10 a day. As a result, two more Air Motors were installed, with similar savings.

You may be the man who brings production or maintenance savings into your plant. A look at I-R's *confidential* manual of reports on "AIRengineering at work" could point the way. Write on your company letterhead, and we'll arrange for you to see it.

Air Motor raises and lowers collapsible core. Here the mold is open showing the core in "up" position.



## **Ingersoll-Rand**

11 Broadway, New York 4, N.Y.

### **AIRengineering Manual**

Don't miss over 100  
interesting case history  
applications of  
AIRengineering in this  
confidential manual

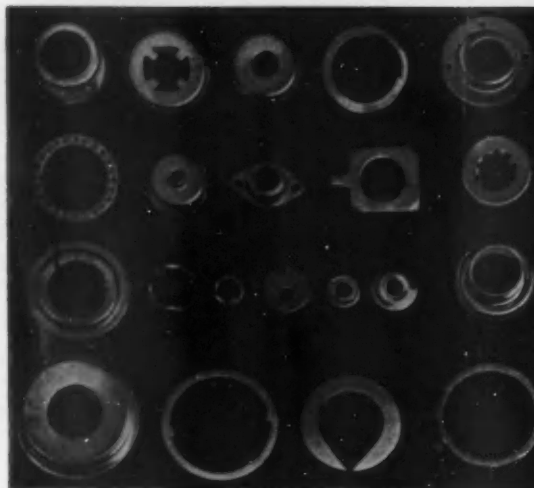


8-271

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**SINCE  
1887**



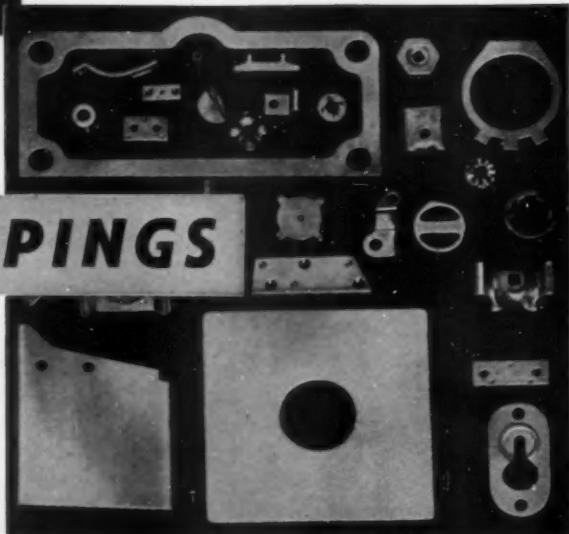
Our equipment for handling contract production of stampings includes presses for blanking, forming, drawing, shearing and extruding. In many cases it is possible to produce stampings at a lower cost than they can be produced in your own plant, with our own equipment. Our own tool and die-making shop enables us to make up the necessary tools to fit your specifications.

We are equipped to furnish stampings in any desired materials and finishes, ranging in size from small parts to large heavy-gauge pieces. Our engineering staff will be glad to co-operate with you in every way consistent with economical and efficient production.

• • •

Send us your blueprints for quotations on special washers and stampings made to your individual specifications. Write for copy of 76-page Catalog "30" with tool list and complete round washer specifications.

## STAMPINGS

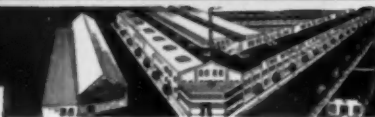


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**F. P. Williams, President  
S. S. Kresge Company**

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chandise and developments in the retail variety field."*

To carry Mr. Williams' thought a step further, men and women who have to keep their thinking a step ahead of their work have one common characteristic. They read thoroughly the publications that give them the most help.

Just as the Kresge executives follow their business publications for trends and developments in the lines of their special interests, so leaders in every field of business and professional activity study each issue of the business periodicals in their own fields.

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MOVES IN THE BEST CIRCLES



*\*The Oakite CrysCoat  
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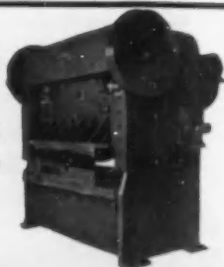
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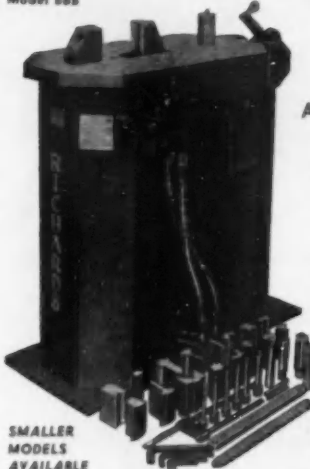
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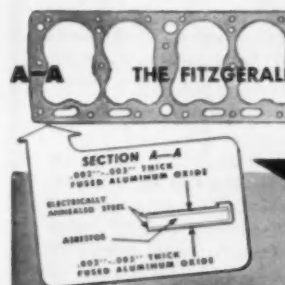
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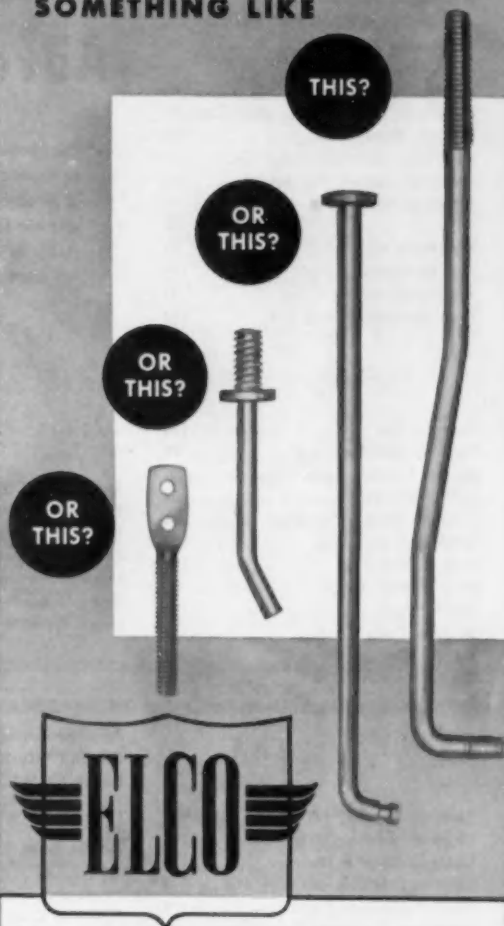
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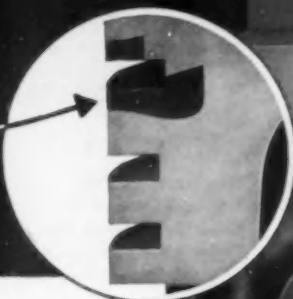
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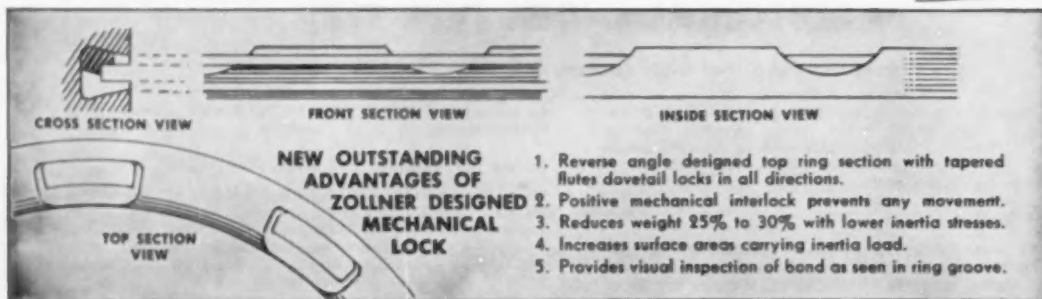
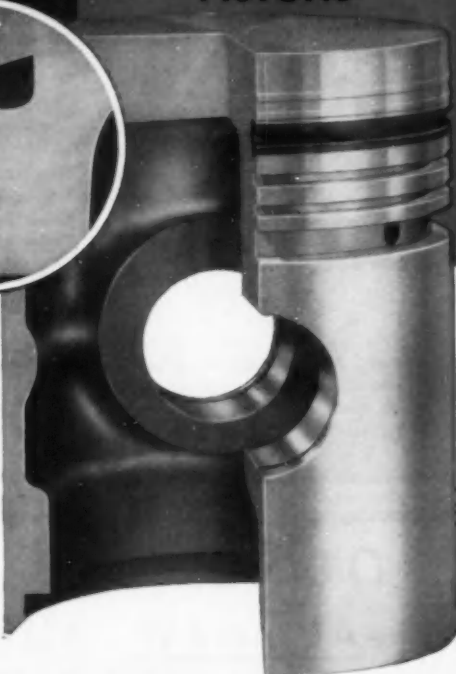
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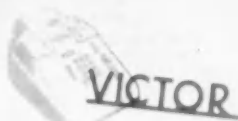
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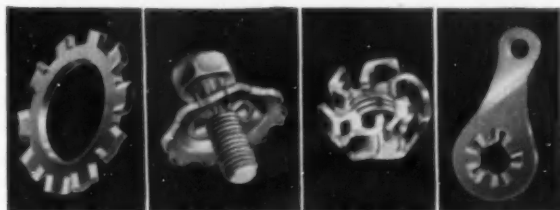
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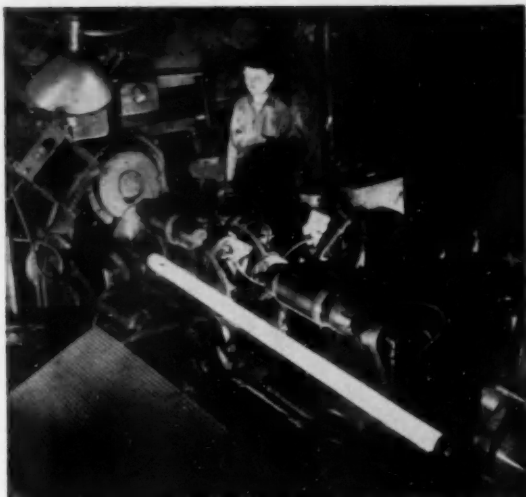
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WE NEED THE WORLD'S BEST bearing steel so we make our own. We're America's only bearing manufacturer that does. And we make it nickel-rich for superior toughness. Shown above is a piercing mill that makes seamless tubing for Timken bearing cones and cups. This mill uses the Timken-Company-developed "elongator" process that gives closer size tolerances than conventional mills.



WE WORK FOR YOU, making special tests and studies. This test simulates actual driving loads on truck front axles. It "runs" axles thousands of miles, helps show truck manufacturers how to get longer bearing life. Service like this is another reason for always specifying "Timken" with the bearing number. And for full value always use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

NOT JUST A BALL ○ NOT JUST A ROLLER □ THE TIMKEN TAPERED ROLLER □ BEARING TAKES RADIAL ○ AND THRUST —○— LOADS OR ANY COMBINATION —○—